WESTERN GAS

January
1929

20 Cents
the Copy

A section of down-town Shreveport, Louisiana, where the Southwest Division of the American Gas Association's Natural Gas Department meets on January 14 and 15.

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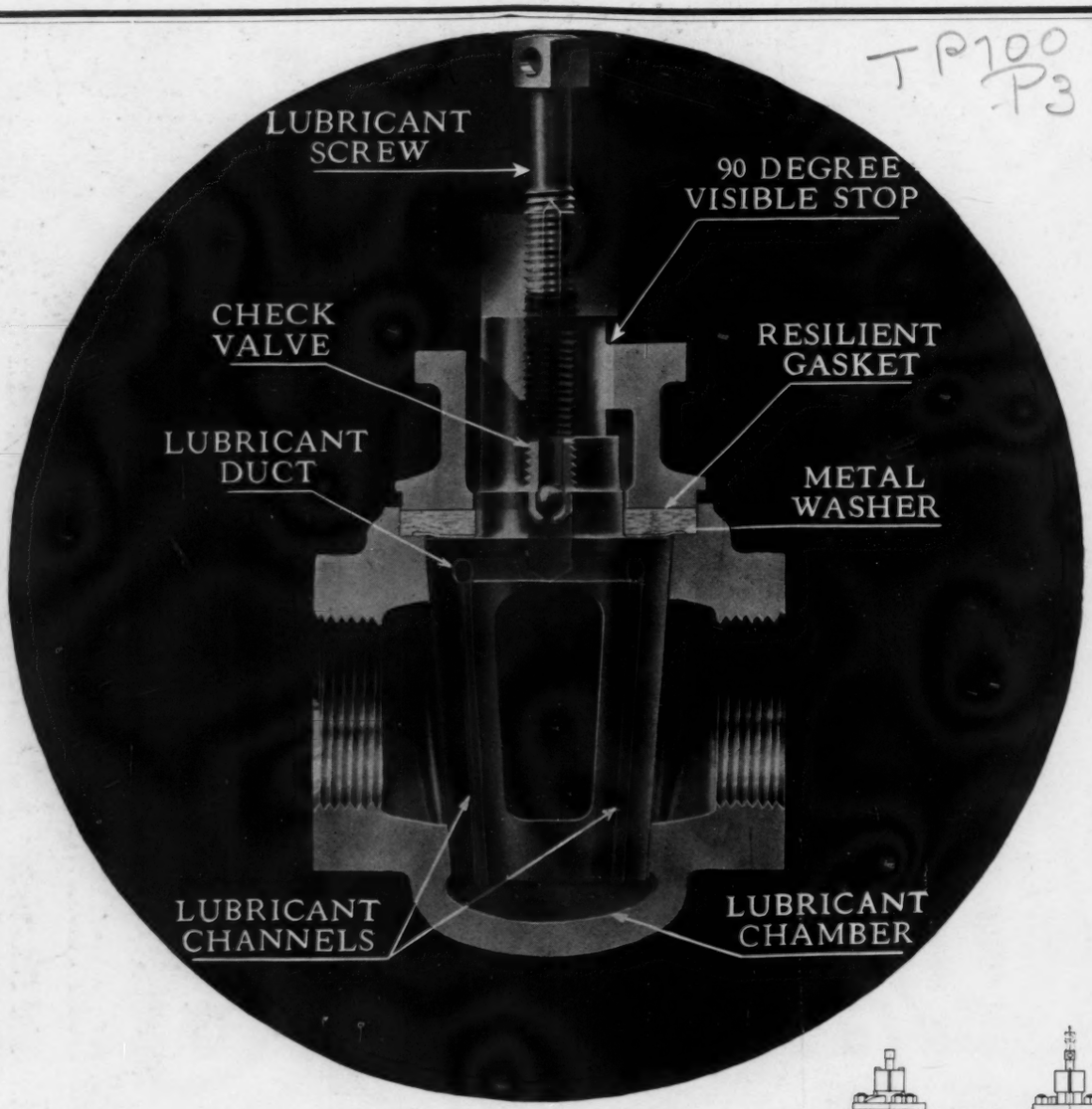
A MONTHLY JOURNAL DEVOTED TO THE
WESTERN GAS & APPLIANCE INDUSTRIES

TP700
.P3

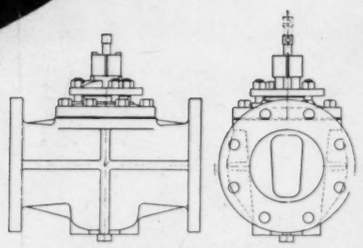


Nordstrom Valves

keep gas lines sealed

The genuine lubricated Valves, with patented features. Lubricant under pressure seals the plug, preventing gas in the line from passing around the plug. A turn of the lubricant screw increases the pressure of the lubricant. Different types for gas distribution lines, plant service, meter and curb service, etc.

Our New Catalog No. 6 gives full details. Ask for a copy.



"Venturi" Type
Manufactured regularly for pressures up to 150 pounds per square inch. "Venturi" Valves for higher pressures on special order.

Merco Nordstrom Valve Co.

Subsidiary of The Merrill Company

Engineers . . . Manufacturers

NEW YORK CITY—11 W. 42nd St.
BOSTON—184 Boylston St.
BUFFALO—Genesee Bldg.
PITTSBURGH—
LOS ANGELES—556 S. San Pedro St.
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Canadian Manufacturers—PEACOCK BROS., LTD.—Montreal, Que., Cobalt, Ont., Winnipeg, Man., Vancouver, B. C.

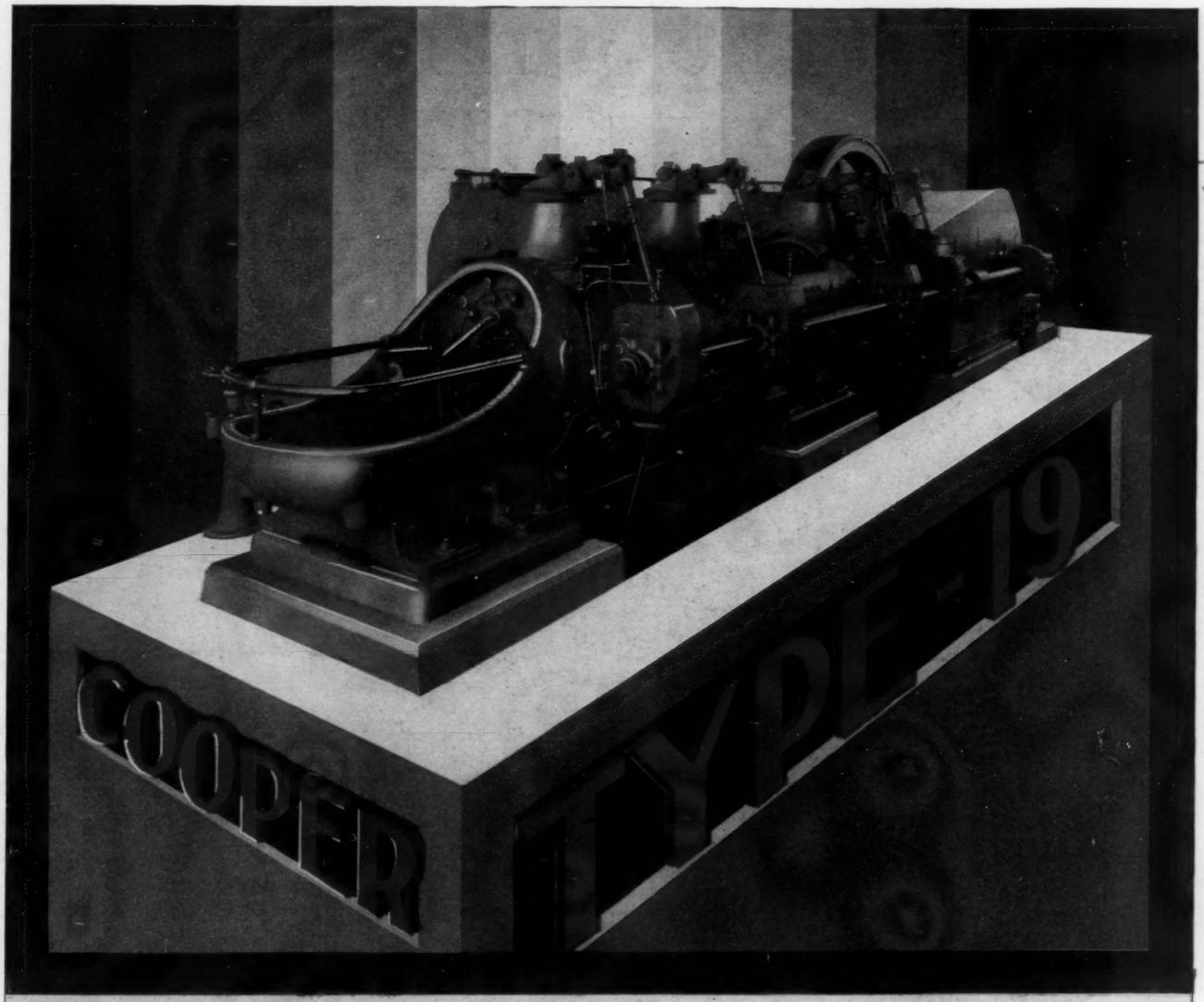
FACTORIES: Oakland, Calif., and Belleville, N. J.

MERCO

REG. U. S. PAT. OFF.

BBB Mar. 7, 1931

944
3507



An intermediate size gas engine—built for conditions where the utmost in continuous, reliable and economical operation is desired. They provide maximum power for minimum weight and exceptionally low installation and maintenance costs.

Rated 380-400 B. H. P. as single tandems and 760-800 B. H. P. as twin tandems for direct driving compressor cylinders or electric generators.

THE C. & G. COOPER COMPANY, MT. VERNON, OHIO

1111 Magnolia Bldg., Dallas, Texas — 649 S. Olive St., Los Angeles, Calif. — 615 Kennedy Bldg., Tulsa, Okla.

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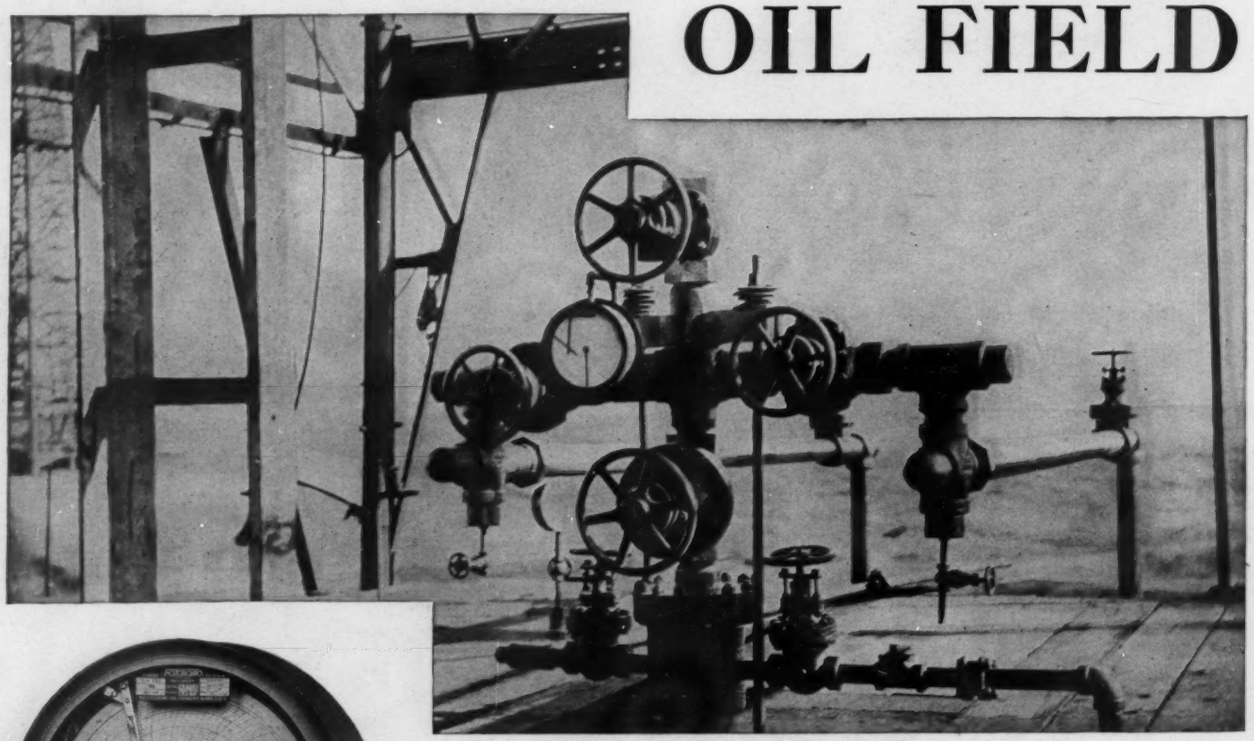
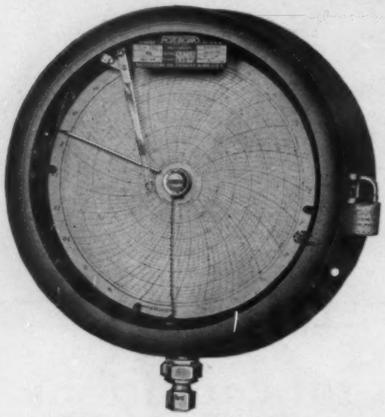
Taking the pulse of the OIL FIELD





Foxboro Recording Gauge

WHEREVER pressure or vacuum gives an indication of operating conditions, Foxboro Recording Pressure Gauges will earn their cost in no time.

Think what a tremendous advantage it would be to you to have valuable information on Water Encroachment — Gas Decline — Gas Lift — Conditions of Pumps — Open Flow Gas Volumes — Rock Pressure When Repressuring.

The accurate records of these oil field operations furnished you by Foxboro Recording Gauges will give you the exact information necessary for profitable operation.

The accuracy and sturdiness of these instruments have made them the choice of oil field men the world over. Special alloy tubes are used on all ranges over 40 lbs. per square inch. These tubes are guaranteed not to fatigue and are not affected by high sulphur content.

Each instrument is sealed with a guarantee of permanent calibration. You stand to lose nothing, but to gain much. Why not have a Foxboro engineer give you the benefit of his experience in the use of these instruments? Write to the nearest Foxboro Branch Office.

THE FOXBORO COMPANY

Neponset Avenue, Foxboro, Mass., U. S. A.

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LOS ANGELES, 443 S. San Pedro St.
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FOXBORO

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THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity & Pressure

This Underground, Gravity Locked, All Cast Iron Meter Box Will be Sent You Free of Charge, No Expense Whatsoever

Find out for yourself, through actual examination and use, why this meter box is being specified by some of the leading gas companies in the Southwest. The box will be sent you free. A letter or a telegram will bring it.

Made of Cast Iron, it lasts many lifetimes. Cast Iron is known to have been in the ground for 250 years. Even sweating does not cause this box to deteriorate. Average weight of box is 175 pounds. Lugs on bottom practically eliminate settling. The round box is much stronger than square or rectangular box and withstands considerable weight on top without breakage. For small additional expense an extra heavy lid can be procured to withstand heavy street or alley traffic.

The meter reading door shown above is a means of economy for you. The time saved in reading meters by this simple process means many dollars saved by you at the end of the year. When the reading door flies open the cover remains in place, yet the cover can be removed instantly from the cast iron "hinge feature" which is securely fastened to the body of the box.

Cast Iron Weight causes Meter Reading Door to fall in place, tightly locked, when key is released, with the positive assurance there will not be a physical liability caused by a loose lid or uncovered box.

Key can be obtained in brass or aluminum. The moment key is released, the self-locking door falls in place.

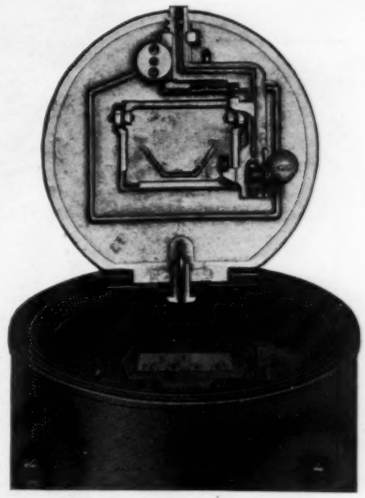
Ease of Operation, Economy and Simplicity of Construction —Three Most Distinctive Characteristics

The Meter is read through a Meter Reading Door, which automatically flies open at turn of key. No back-breaking, wearisome task for the meter reader. No lifting necessary. When key is inserted, it engages gear which operates meter reading door. With an easy turn of the wrist, the door flies open. When key is released, a cast iron weight, working by gravity, causes door to fall into place, locked tight. The same key-turn unlocks cover to box. The locking device is sure, substantial and fool-proof. Meter Reading door and cover, when down are always locked, eliminating injury to playing children or passer-by, also protecting meter, preventing it from being tampered with by children or others. This safety element also allows service to be discontinued at meter stop, and the meter to be left in place without providing stop cock lock.

Gear is used in preference to spring, assuring stability. A spring sooner or later becomes stretched or compressed and is easily broken. The life of a spring cannot possibly be as long as that of a Cast Iron gear. Box can be bought either with or without locking device.

Costs But Little More Than Ordinary Box

We have an outlet for thousands of boxes per month. We also manufacture many other Cast Iron articles, among them River Clamps, which necessitates the melting and pouring daily of many thousands of pounds of Cast Iron. For this reason our Cast Iron Meter Box costs much less, perhaps fifty per cent less than you would estimate, and but very little more than the ordinary box.



Write or Wire Us for Particulars— Ask for a Meter Box Sent Free

We also manufacture
The Red Star Burner

Our boxes, (locked or unlocked) are being used by Lone Star Gas Co., Community Natural Gas Co., Oklahoma Natural Gas Corp., and others.

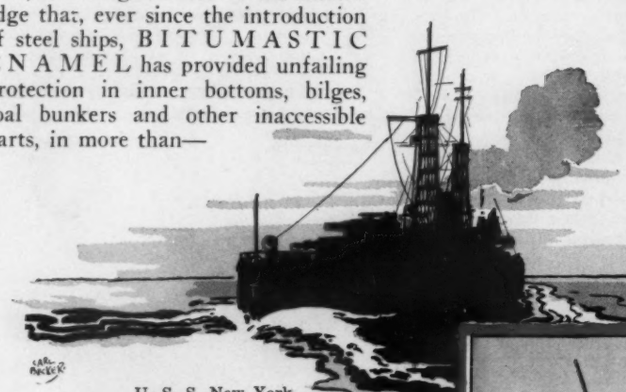
TULSA STOVE & FOUNDRY CO.

Sand Springs **Tulsa**

PROOF

PROVEN PROTECTION FOR PIPE LINES

There has never been a greater need for PROVEN merit than in connection with the coatings used on pipe lines. Engineers must *know* what will happen to these coatings over a long period of time and under the most corrosive conditions. There is, therefore, a true guarantee in the knowledge that, ever since the introduction of steel ships, BITUMASTIC ENAMEL has provided unfailing protection in inner bottoms, bilges, coal bunkers and other inaccessible parts, in more than—



U. S. S. New York

In more than 15,000 of the World's Leading Naval & Merchant Vessels

The Amarillo-Denver Line

The conditions on a pipe line buried underground, of course, do not parallel conditions on a ship. But, from the standpoint of corrosion, conditions in the bilges of a ship are *actually* far worse than on a pipe line and the unfailing performance of Bitumastic Enamel under these highly adverse conditions has led to its adoption for protection of the largest gas and oil lines in the world.

The Amarillo-Denver Line—a 22″ and 20″ gas pipe extending for 340 miles between Amarillo, Texas, and Denver, Colorado—is but one of the large lines protected extensively with BITUMASTIC ENAMEL. Engineers can look towards the future of this line with confidence because they can look back on the experience of more than 40 years. Write for Bitumastic Literature and ask about the service which can now be rendered by our Service Engineers.

BITUMASTIC

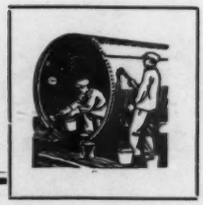
REG. U.S. PAT. OFF.

ENAMEL

Wailes Dove-Hermiston Corporation

17 Battery Place, New York

Philadelphia Cleveland Chicago Houston Tulsa San Francisco



No. 112

No. 65

No. 60

No. 102

No. 85

Above, the "Queen Anne"

A Period Radiantfire, *Like Period Architecture,* Is Ageless

Period architecture never grows old. The passage of years heightens the attractiveness of a well designed house. Age mellows, but can not wither it; for the beauty of period architecture is permanent, ageless.

So with Period models of the Humphrey Radiantfire. Each of them is an authentic version of a basic architectural style—Queen Anne or Duncan Phyffe or Adam or Spanish, for example. Fads do not affect them, any more than fads affect the principles of architecture. In twenty years, or fifty, they will be as beautiful and as correct as they are today.

That is value—the kind of value that makes Period Radiantfires the choice of thousands of buyers.

And for the buyer whose tastes follow current trends, Humphrey makes an appealing line of Radiantfires in COLOR

No. 45

No. 30

No. 25

No. 115A

No. 80

The HUMPHREY Radiantfire

Pacific Coast Manager
C. B. Babcock
135 Bluxome St.
San Francisco

Manufactured by
General Gas Light Co.
Kalamazoo, Mich.

What the P·G·and E· will sell in 1929

...and this is only 10% of the possible business

There will be 20 car loads of Gas Furnaces and Boilers sold, 8 car loads of Radiant-fires and small heaters, 35 car loads of Gas Water Heaters and 44 car loads of Modern Gas Ranges.

Statistical studies show clearly that of the possible field, only 10% can be sold by Company salesmen, leaving 90%—cultivated and partly sold—available for the dealers.

Cooperation is the foundation of our sales policies and we will welcome constructive suggestions that will lead to better service for the public.

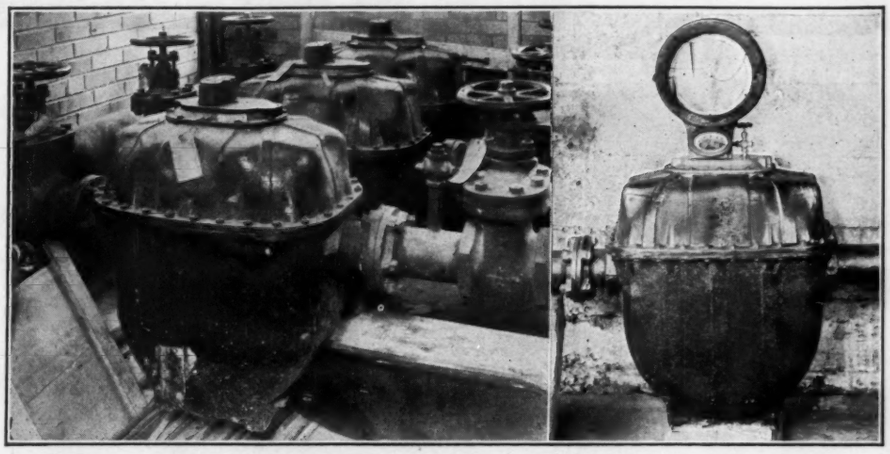
PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

245 Market Street
SAN FRANCISCO

H. M. CRAWFORD,
General Sales Manager.



One Meter or a Dozen

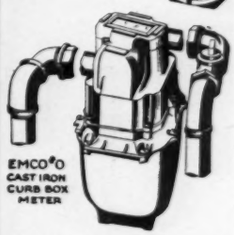
MANIFOLDING positive meters is a growing practice in industrial measurement. The EMCO removable valve plate, which permits the removal of the entire measuring apparatus, without disturbing the line connections, adds materially to the advantage of manifolding. Complete service changes can be made without interrupting the consumer's service.

In single meter installation, complete renewal with calibrated measuring mechanism, requires but a few minutes' work, leaving the line connection intact.

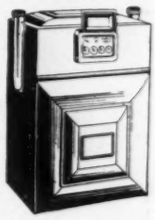
At left above, a typical factory installation. At right, single meter used with EMCO Combined Record Gauge.

EMCO #0 CAST IRON DRY GAS METER

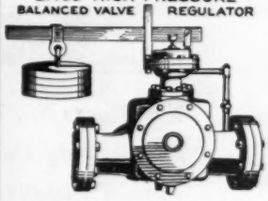
IRONCLAD CAST IRON DRY GAS METER



EMCO #0 CAST IRON CURB BOX METER

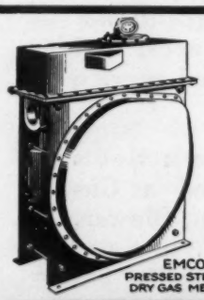


EMCO TIN METER

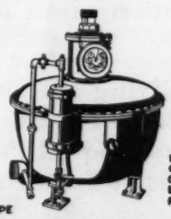


EMCO HIGH PRESSURE BALANCED VALVE REGULATOR

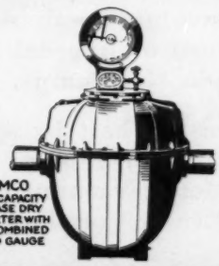
EMCO WATER HEATER AND GAS APPLIANCE REGULATOR



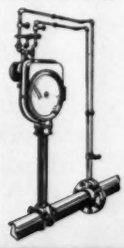
EMCO #5 PRESSED STEEL TYPE DRY GAS METER



WESTINGHOUSE FLUID POSITIVE GAS METER

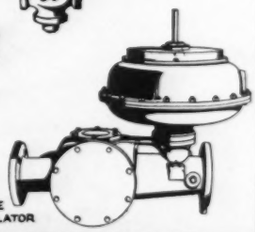


EMCO LARGE CAPACITY CAST CASE DRY GAS METER WITH EMCO COMBINED RECORD GAUGE



EMCO ORIFICE GAS METER

EMCO DOMESTIC SERVICE REGULATOR



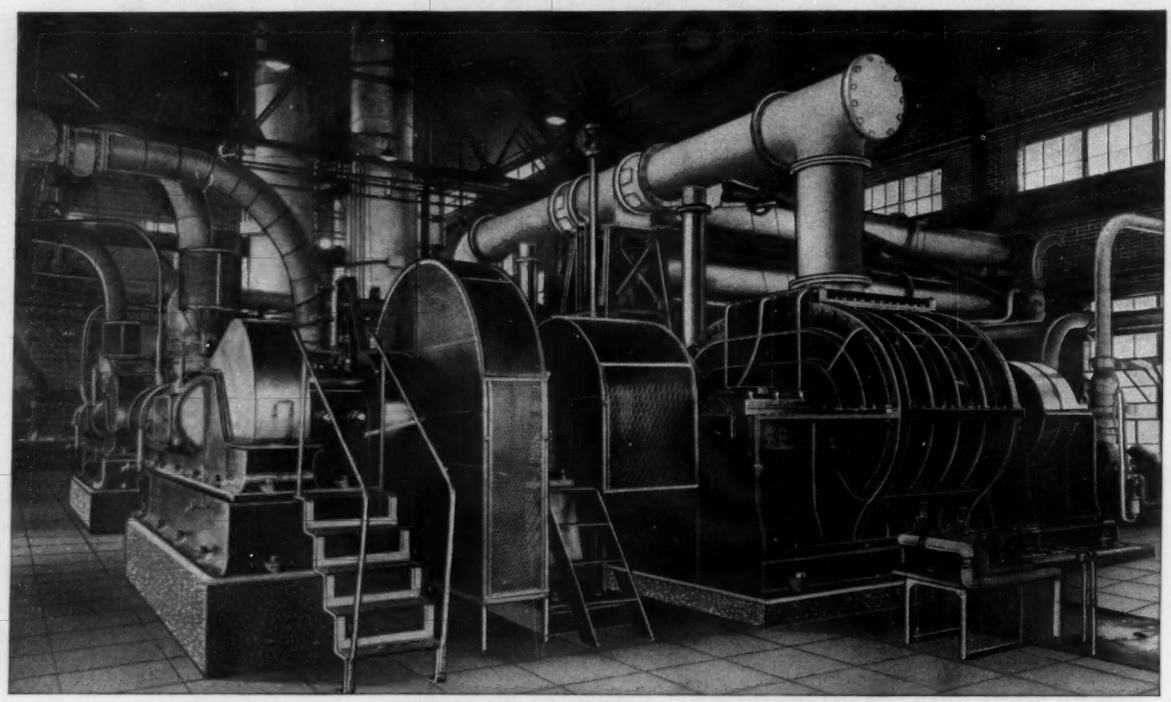
EMCO LOW PRESSURE BALANCED VALVE REGULATOR

PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS PITTSBURGH, PA.

NEW YORK CHICAGO COLUMBIA, S.C. LOS ANGELES DALLAS TULSA SEATTLE KANSAS CITY SALT LAKE CITY

ROOTS



ROOTS

Two Roots No. 12½ Heavy Duty Gas Pumps Installed in large Southern By-Product Coke Plant.

Roots Service

Roots service is dependable, satisfactory service. From conception to the finished product every detail is carefully wrought and inspected.

Oversize shafts, heavily ribbed cases, adjustable self-oiling bearings, sturdy gears of *conventional* 14½° involute tooth design, exact clearances, and the absence of internal friction mean added service from Roots Gas Pumps.

Secure the best by specifying that it be a Roots product—regardless of whether you need a Gas Pump, Meter, Vacuum Pump, Liquid Pump, Blower, Gate, Valve or Coupling. Write for details.

Western Representative: Sutor & Co., 2008 East Slauson Ave.,
Los Angeles, California

The P. H. & F. M. ROOTS CO.

CHICAGO
Peoples Gas Building

CONNERSVILLE, INDIANA

NEW YORK
120 Liberty Street

Originators of the Double Impeller Rotary Principle

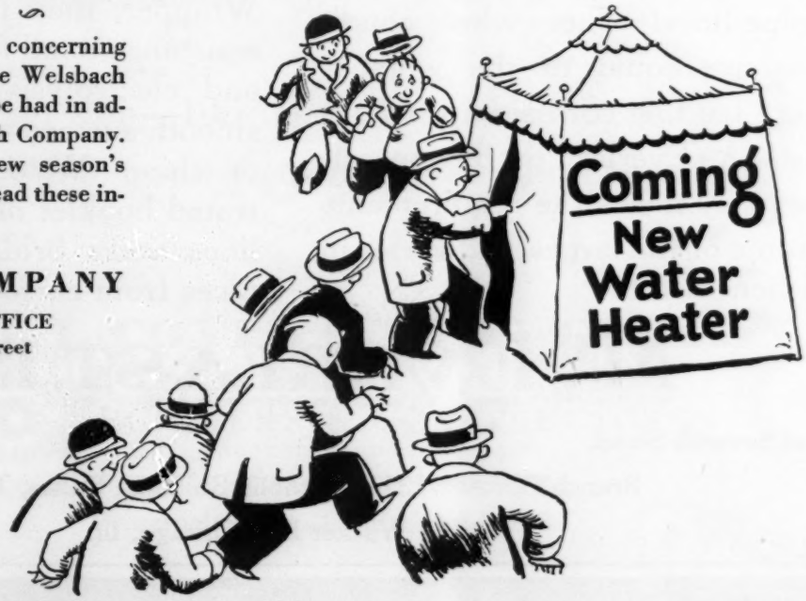
REDUCED PRICES

On Welsbach HOTZONE

SELF ACTION GAS WATER HEATER

THE WELSBACH POLICY has always included a consistent effort to increase the gas company market for Water Heaters. This new price revision is another long step forward . . . All Welsbach Water Heaters may be had with or without safety gas shut-off and temperature-pressure relief valve.

Confidential information concerning the newest addition to the Welsbach Water Heater family may be had in advance by writing Welsbach Company. Do not complete your new season's contracts until you have read these interesting details.

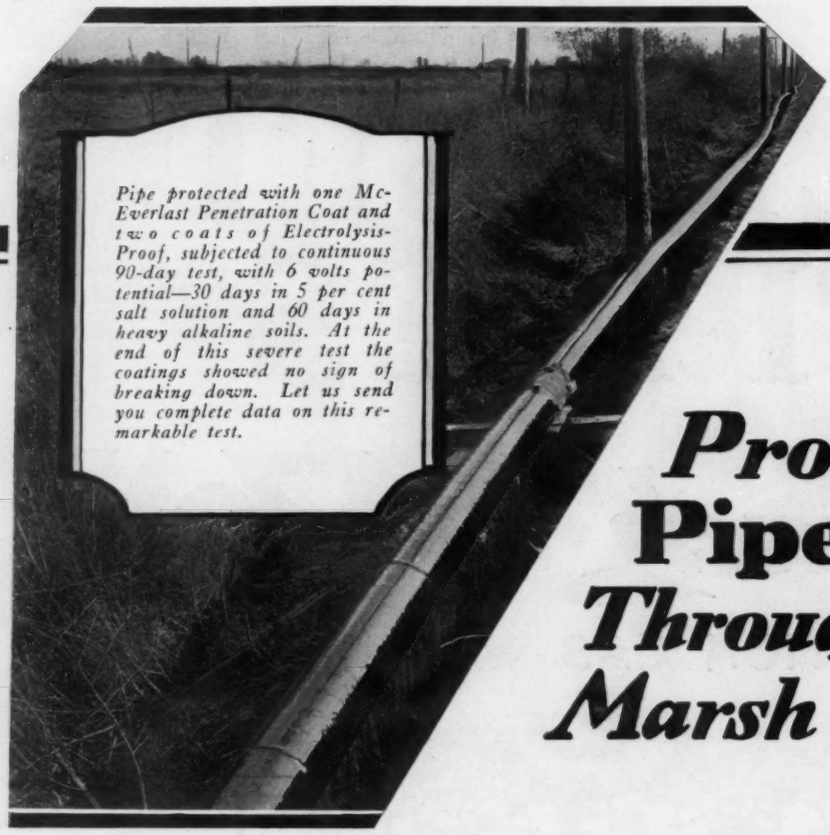


WELSBACH COMPANY

SAN FRANCISCO OFFICE
863-865 Mission Street

Member
American Gas Association

Member
Pacific Gas Association


Pipe protected with one McEverlast Penetration Coat and two coats of Electrolysis-Proof, subjected to continuous 90-day test, with 6 volts potential—30 days in 5 per cent salt solution and 60 days in heavy alkaline soils. At the end of this severe test the coatings showed no sign of breaking down. Let us send you complete data on this remarkable test.

Protecting Pipe Lines *Through Alkali Marsh Lands-*

IN certain swampy soils of California—soils impregnated with strong alkalis such as caustic soda, potash, sodium sulphate—McEverlast Protective Coatings are preventing corrosion on miles of pipe lines! There where conditions are equal to the worst—where baffling corrosion problems exist—McEverlast protection satisfactorily meets the requirements of some of the largest industries in the Southwest!

Asphalt in Suspension

McEverlast coatings composed chiefly of live Bermudez asphalt and Gilsonite held in suspension by special process. Applied together with McEverlast Osnaburg Wrapper, they furnish maximum resistance to all forms of corrosion and electrolysis—leave a tough, smooth surface which won't crack or chip. Write today for illustrated booklet on protecting pipelines, tanks, bridges and other surfaces from corrosion.

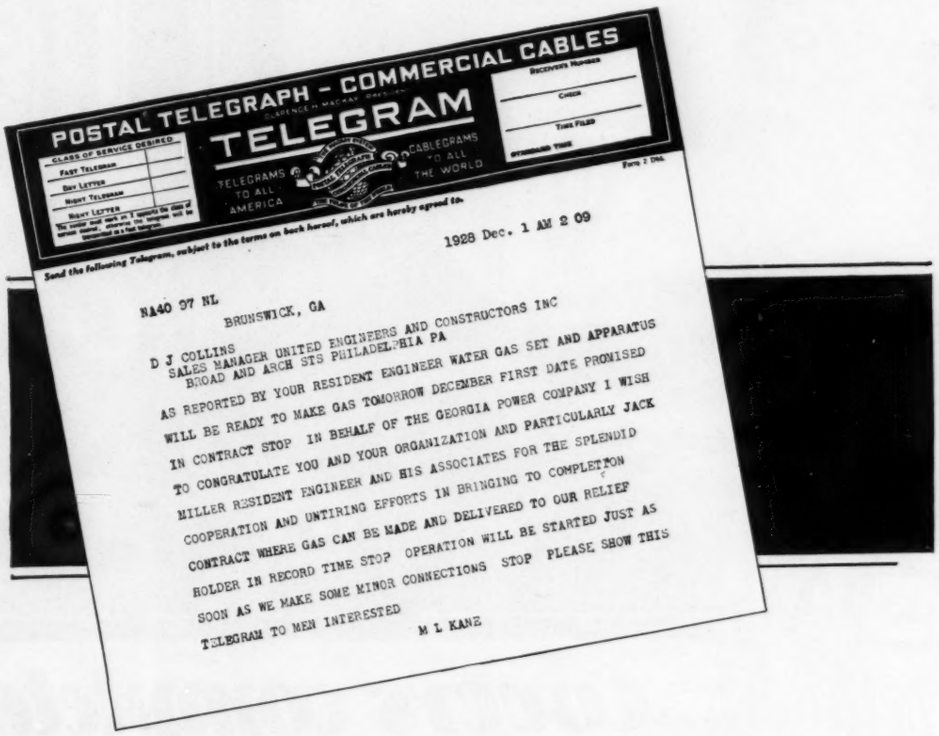
McEVERLAST, INC.
[T.M. REG.]

111 West Seventh Street **Los Angeles, California**

Branch Offices: 1314 Magnolia Building, Dallas, Texas

35 E. Wacker Dr., Chicago, Ill.

. . . IN RECORD TIME



POSTAL TELEGRAPH – COMMERCIAL CABLES

TELEGRAM

TELEGRAMS TO ALL AMERICA

CABLEGRAMS TO ALL THE WORLD

Send the following Telegram, subject to the terms on back hereof, which are hereby agreed to.

1928 Dec. 1 AM 2 09

NA40 27 NL

BRUNSWICK, GA

D J COLLINS
SALES MANAGER UNITED ENGINEERS AND CONSTRUCTORS INC
BROAD AND ARCH STS PHILADELPHIA PA

AS REPORTED BY YOUR RESIDENT ENGINEER WATER GAS SET AND APPARATUS WILL BE READY TO MAKE GAS TOMORROW DECEMBER FIRST DATE PROMISED IN CONTRACT STOP IN BEHALF OF THE GEORGIA POWER COMPANY I WISH TO CONGRATULATE YOU AND YOUR ORGANIZATION AND PARTICULARLY JACK MILLER RESIDENT ENGINEER AND HIS ASSOCIATES FOR THE SPLENDID COOPERATION AND UNTIRING EFFORTS IN BRINGING TO COMPLETION CONTRACT WHERE GAS CAN BE MADE AND DELIVERED TO OUR RELIEF HOLDER IN RECORD TIME STOP OPERATION WILL BE STARTED JUST AS SOON AS WE MAKE SOME MINOR CONNECTIONS STOP PLEASE SHOW THIS TELEGRAM TO MEN INTERESTED

M L KANE

The installation referred to is a six-foot U. G. I. carburetted water gas apparatus complete, including Chrisman Cycle, blowing plant, fuel hoist, U. G. I. high duty condenser and immersion washer. Built in 30 days from date of contract to date of completion.

▪ ▪ ▪ ▪

U. G. I. service—like U. G. I. equipment—may be depended upon to meet every emergency.

▪ ▪ ▪ ▪

THE U. G. I. CONTRACTING COMPANY

DIVISION OF

UNITED ENGINEERS & CONSTRUCTORS

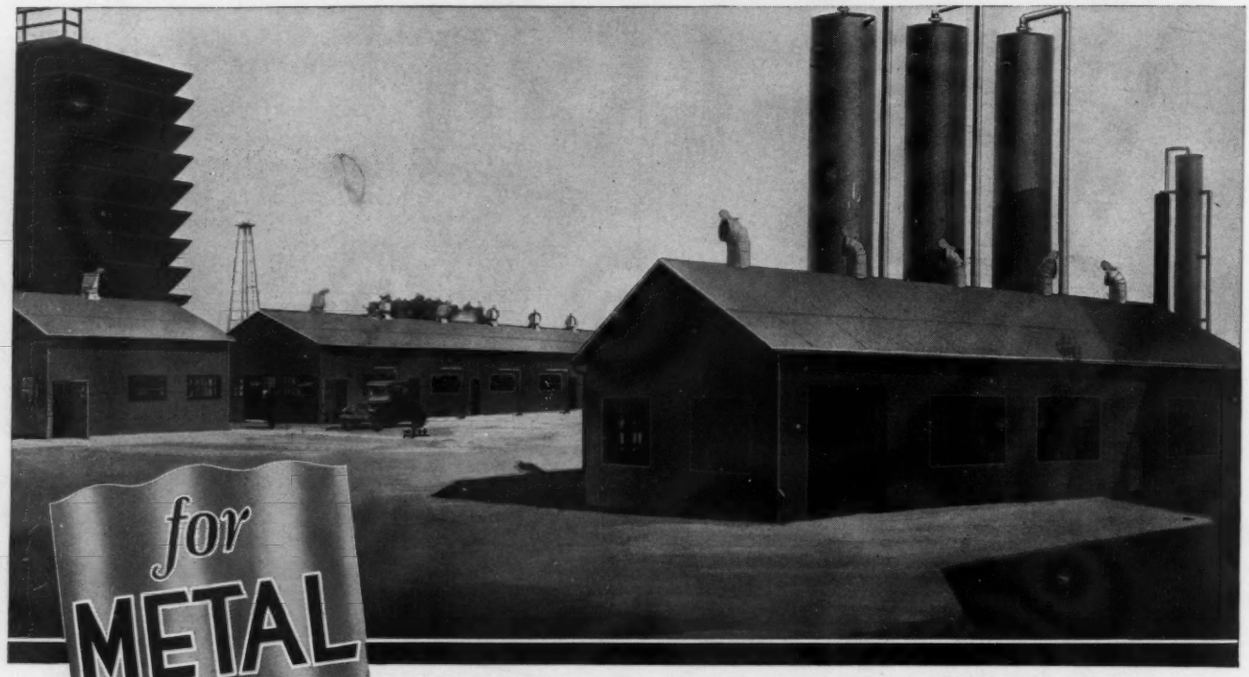
INCORPORATED

DWIGHT P. ROBINSON, PRESIDENT

Principal Office — Philadelphia

CHICAGO ATLANTA

L&S PORTLAND CEMENT PAINT

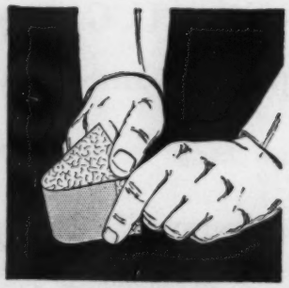


for METAL *Surfaces*

Covers completely in ONE coat

The unusual tenacity and hiding power of L & S Portland Cement Paint is attested to by the fact that ONE coat, in most cases, is sufficient to cover completely. The result is that the use of L & S Portland Cement Paint effects increased surface protection against Fire, Weather and Water, at one-half to one-third the cost per job of other cement-contained paints.

L & S Paint is recommended for all metal surfaces, without exception, as well as brick, concrete, stucco and even glazed tile. It greatly reduces fire hazards when applied to wood surfaces. The perfect bonding qualities of L & S Paint are illustrated by the test shown at left: L & S has been applied to ordinary galvanized sheet iron metal, untreated in any way. The sheet can be bent double until the galvanizing leaves the metal, but the L & S will still adhere firmly. Furnished in eleven attractive shades and black and white.



HILL, HUBBELL & COMPANY

Division

General Paint Corporation

Manufacturers of Highest Grade Oil Industry Paints and Pipe Line Coatings

General Offices: SAN FRANCISCO

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1929

Rex Partnership Plan

for Gas Companies

Since The Cleveland Heater Co. started to build water heaters, back in 1905, they have always realized that any development of gas utilization can best be done by working shoulder to shoulder with gas companies.

It is a matter of record that The Cleveland Heater Co. has a large established connection with the gas industry. Gas companies have been selling Rex Water Heaters since way back in 1905. A long history of successful service. For these reasons no other manufacturer of water heaters knows the gas man's problems so well and so fully understands his responsibility.

The Cleveland Heater Co., now, announces the formation of a gas company division for the specific purpose of greater and more intensive cooperation. Definite policies have been adopted and are now in force which make Rex more than ever the most attractive and profitable gas water heater partnership ever offered to you.

Outstanding in the 1929 Rex Partnership Plan are:

Better Prices
More Sales Cooperation

If you are interested in making a connection with the manufacturer of gas water heaters who talks your language, who has a clear understanding of your problems, who is anxious and able to furnish every cooperation, and who builds water heaters that will be a continued source of profit, satisfaction and public good-will, you are invited to send for—

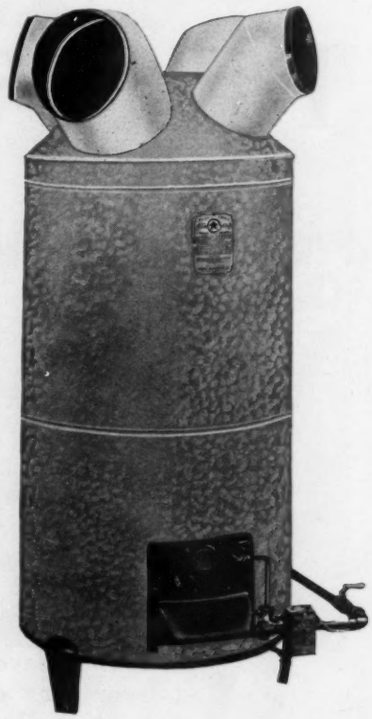
1929 Cooperative Plan
Price List
Merchandising Plan

THE CLEVELAND HEATER CO.

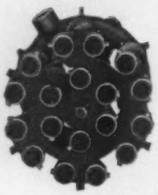
1900 West 112th Street **Cleveland, Ohio**

The Pacific Announces a New Line

of Unit Gas Furnaces Approved by the American Gas Association



This furnace is round instead of square. As a result there are no corners and no dead air spaces. There is better circulation because of the absence of corners. Consequently, heating is accomplished more quickly. The heating element is completely welded throughout, is gas tight, and permits no combustion fumes to escape. The heating unit is of 20-gauge pure Ingot Iron Toncan metal, known for its rust resisting qualities.



Pacific has devoted years to the development of this new furnace which now carries the BLUE STAR OF APPROVAL. Back of this approval is our 15 year old reputation as the leading and largest gas heating organization in the West.

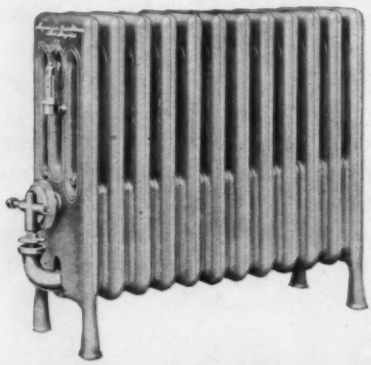
New Multi-Tubular Burner

Each burner has its independent injection of gas. Primary air for combustion is directly siphoned at each individual burner. There is no need for adjusting of the gas and air for combustion as this new Pacific Burner is scientifically designed to automatically give the correct proportion of air to gas. This results in complete combustion and a high temperature flame of proven economy. No soot. No odors.

Pacific Unvented Gas Steam Radiators Also Approved

By selling the Complete Pacific Line You Have the Advantage.

Because with the complete Pacific line you can offer the correct solution to every heating problem. Where other heating salesmen stress their particular appliance, our agent selects from a full line the appliance best suited. We have a real money making proposition. Write for particulars.



And NOW, Pacific Unvented Gas Steam Radiators, furnished in 4 column pattern 26, 32 and 38 inches high, carry A. G. A. BLUE STAR SEAL OF APPROVAL. In addition to this approval, the Pacific Gas Steam Radiators are approved by the Underwriters' Laboratories.

Pacific Gas Radiator

Gas Heating **Company** *Headquarters*

Roseberry and Walter Streets, Huntington Park, California

MANUFACTURERS *of* EVERY TYPE *of* GAS HEATING APPLIANCE

WESTERN GAS

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Los Angeles, Calif. Telephone TUcker 8982

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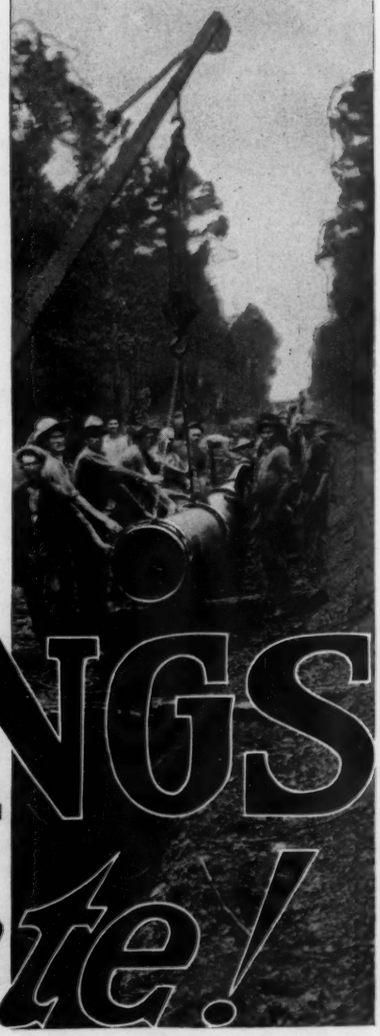
DRESSER

DURABLE RESILIENT ECONOMICAL SIMPLE SAFE EFFICIENT RELIABLE

A Combination of Essential Factors for Satisfactory Service



COUPLINGS *Dominate!*

WESTERN GAS

"Reg. U. S. Pat. Off."

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

SAN FRANCISCO — LOS ANGELES — DALLAS

Consensus *of* Executive Opinion *Is for* Upward Trend *in* 1929

A YEAR ago *Western Gas* requested a number of gas company executives to express their views on what the industry might expect the trend of activity to be in the year ahead, judged from the definite basis of the local outlook in each executive's territory. Conservative optimism was the tone of the replies, and as the national totals for the industry come in it is evident that these 1928 forecasts were sound. The industry's essential claim to soundness is never better vindicated than when it shows advances in periods when general business hesitates. Close estimates of manufactured gas sales in 1928 place them at 490 billion cubic feet, a gain of 18 billion over 1927, which was itself a record-breaking year for gas consumption. Gross revenue also is estimated to have increased over 1927 by some $18,000,000, during the year closed.

For 21 years the manufactured gas industry has registered annual gains in gas sales and gross revenue, and this remarkable record gives every indication of bettering itself beyond the fondest hopes of earlier periods. More recently the bringing of Western America's abundant natural gas resources to an increasing population has formed a companion story of memorable growth.

From this heartening background the industry turns to 1929 with confidence. Again *Western Gas* presents its readers with a cross section of opinion on 1929 developments from national leaders in the industry, with particular reference to local conditions in population centers of Western America. In the following pages appear concise statements from company executives, national and regional association officials, and others whose affiliations give them insight into the industry.

Several indications stand out in these statements which seem to stamp the mood of the industry as aggressive and optimistic for 1929 and the years that follow. Not the least of these are the recurring expressions which tell of emphasis being placed on sales promotion. Within the past year a number of major Western companies have set up year-round sales programs and are actively at work pushing gas appliance merchandising and industrial utilization on their systems. In 1929 a number of companies are definitely committed to readjustment of rates, looking to larger sales activity.

Another inescapable trend is that toward extending of the benefits of natural gas. Sections which have been considered far beyond the economic limits of natural gas service are now, thanks to assurance of sufficient supplies, brought within the reach of the natural gas main. The year ahead will see natural gas lines carried to northern California, to a population of one and a half millions. Communities in several of the Mountain and Middle Western States now have in definite view the same prospect for natural gas service which has brought the current mushroom growth in the gas industry of the Southwestern states. Coincident with this natural gas development comes a growth in the closely related natural gas gasoline industry which is due for a larger output and sale of its valuable commodity this year.

Guided by the opinion of the industry's leaders as expressed in these pages at the invitation of *Western Gas,* we see for 1929 an upward projection of the gas curve, based upon the industry's determination to concentrate its combined forces upon the winning of its logical markets.

P.C.G.A. Head Is Optimistic

I DESIRE to point out the favorable outlook facing the Pacific Coast industry in the immediate future. The fear of early depletion of natural gas has been dispelled, and on the other hand, remarkable discoveries during the past year in California will never remotely dreamed of the possibility valuable fuel in parts of the State which possibility never was remotely dreamed of. several years ago. Aggressive sales effort in the Northwest is giving low priced electricity remarkable competition. New industrial uses for our commodity are being found continually and better public relations progressively evidences the mutuality of interest between distributor and user of gas.

Chas. H. Dickey,
President, Pacific Coast Gas Association,
San Francisco, Calif.

Industry's Morale Is Right

NINETEEN-TWENTY-NINE should be an important year in gas industry history, especially with us on the Pacific Coast. I say this not in reference to sales or dividends or such practical, mundane things, because these, while important, do not make one year stand out above another in our progressive industry. Their absence, not their presence, would make history.

I refer more especially to the co-operative spirit, to the sales consciousness, to the fighting heart, and to improved morale. I refer to those things of the spirit and heart in which our industry has been somewhat

lacking in past years and which are now about to bloom.

I predict that the gas industry will, during 1929, make vast strides in attacking its sales and rate problems, and that in consequence the industry will become a bigger and better one in which to work.

Clifford Johnstone,
Executive Secretary, Pacific Coast Gas Assn., San Francisco, Calif.

Denver

THE natural gas outlook for the Denver district in 1929 is most promising. The Public Service Company will increase house-heating customers 100 per cent and the industrial gas increase should amount to 1000 per cent. Healthy progress will be shown in domestic, hotel, and restaurant divisions.

Extension to distribution system for both domestic and industrial for the city of Denver amounts to $250,000. To properly care for growth in natural gas demands a generous portion of our new $500,000 warehouse will be made available for service and extensions. In November last year Littleton, Colorado, granted the Public Service Company a franchise which will add several hundred customers to our mains. Other suburbs and nearby towns are considering natural gas service and are expected to be brought into the system in 1929.

Clare N. Stannard,
Vice-President and General Manager, Public Service Company of Colorado, Denver, Colorado.

Los Angeles

AS the result of capital expenditures totaling more than $2,000,000 during 1928 in extensions and betterments the physical properties of our company are in condition to render first-class service to our domestic and industrial consumers.

Because of these heavy expenditures the past year and for a year or so previous, we plan to use probably less than $1,500,000 in betterments and extensions during 1929. During the past year we have added 8,000 meters to the lines of the company and we anticipate that the increase during 1929 will be about the same.

We find an increasing appreciation of the value of the "Laboratory Approval Seal" in modern gas appliances. The advent of the gas-fired refrigerator for domestic use has brought a fresh focus of favorable public opinion to the many conveniences provided, through natural gas, for modern homes. We consistently accent the word "Modern" in our advertising and sales departments with the thought "Modern Homes Use Gas" frequently expressed.

Industrial use of natural gas, especially in Southern California, should show substantial gains during 1929 and we hope to get our share of this increase.

F. S. Wade,
President and General Manager, Southern Counties Gas Company, Los Angeles.

18 Per Cent Gain Seen for 1929

DURING 1928 our gas properties increased merchandise revenues 100 per cent through systematic merchandising program. During 1929 we plan pushing the use of gas for house heating, at present development the third and lowest class field for domestic use. House heating has passed the experimental stage and the potential volume of business in this field is enormous. Cost of gas service is gradually decreasing while liquid and solid fuels are steadily advancing. Because of this, together with development of more efficient furnace equipment and gradual improvements in construction of houses, there seems no question about this business growing with steadily increasing demand.

Our 1929 budget calls for large new construction expenditures on gas properties. We estimate increase of 18 per cent in gross for 1929.

Wilbur B. Foshay,
President, W. B. Foshay Company, Minneapolis, Minn.

Northern and Central California

THE oustanding development in the gas industry in Northern and Central California in 1929 will be the bringing of natural gas from the Buttonwillow Kettleman Hills and other sections of the south end of the San Joaquin Valley to San Francisco, Oakland, Berkeley, San Jose, Richmond, and other communities located in the San Francisco Bay area or in proximity to the projected pipeline. This new and cheaper service will benefit a population exceeding one and one-half million and will undoubtedly prove a factor of extreme importance in the industrial development of this section. I am optimistic about the future of the gas business and confidently anticipate that 1929 will be one of increasing usefulness and sound growth for this ideal fuel.

A. F. Hockenbeamer,
President, Pacific Gas and Electric Company, San Francisco.

A.G.A. Leader Points 1929 Trend

WHILE the progress of the gas industry in 1928 has fully measured up to the prospects indicated for it during the early part of the year, it is possible at this time to visualize more clearly the exact direction which expansion in this field is likely to take during the period ahead.

Research along the lines, not only of technical and engineering studies, but also of gas utilization, marketing and all of the departments and activities that go to make up the rendering of good gas service throughout the nation, has given the entire industry a new vision and realization of vast potentialities for future development.

The consolidation of the American Gas Association with the Natural Gas Association of America, which took place during the latter part of 1927, has made it possible for these closely parallel branches of the industry to embark upon joint activities of a mutually advantageous character.

The American Gas Association Testing Laboratory, at Cleveland, Ohio, is extending its work notably in improving the efficiency of countless applications of gas fuel and in protecting the public against unsafe gas appliances. A recent report of the laboratory states that 30 per cent of the gas-fired boilers and furnaces, 50 per cent of the water heaters, 60 per cent of the space heaters, and 75 per cent of the gas ranges sold during 1928 will bear the laboratory seal of approval.

Although it is too early as yet to make any more than a general estimate of the trend of gas consumption for the calendar year, observers' opinions are that a new advance in gas sales throughout the country will again be reflected in the final returns.

Outstanding developments include the increased use of gas for manufacturing purposes, as well as a condiserable advance in the fields of domestic central heating, refrigeration, and large volume water heating.

In the last eight years the volume of manufactured gas used for industrial purposes has about doubled, while the amount of natural gas so used has more than doubled, increasing 109 per cent. Gas today has more than 21,000 separate uses in industry.

The average customer of manufactured gas now uses 70 per cent more gas per year than when the gas industry dominated the lighting field. As a domestic fuel it is in secure and growing favor. The securities of gas companies, together with those of all other utilities, are in the highest favor and public demand. Public confidence has never been stronger.

The gas industry is keeping step with the economic changes of the times and to a greater extent than ever before is anticipating the needs of the future.

Oscar H. Fogg,
President, American Gas Association, New York, N. Y.

National Totals for 1928

A NEW record for gas consumption, adoption of large scale research enterprises, scientific advancement of great potential significance in the manufacturing and utilization departments of the business and uniformly good public relations, sound regulation and growing earnings, have all served to make 1928 a memorable year in the gas industry.

The Statistical Department of the American Gas Association announces that preliminary estimates of sales for 1928 reveal an increase of 18 billion cu. ft. over the record-breaking total registered for 1927. The estimated 1928 figure is 490 billion cu. ft., a new high record, proportioned as follows:

338 billion cu. ft. for household purposes.
147 billion cu. ft. for industrial and commercial uses.
5 billion cu. ft. for miscellaneous purposes.

Customers served by the manufactured gas industry now number 11,800,000, an increase of 350,000 over 1927. The industry has 93,500 miles of main, 2,100 having been added to the total during 1928. Operating revenue is estimated at $519,000,000, an increase of $18,000,000 over the previous year. Investment stands at three billion dollars.

It is interesting to note that the manufactured gas industry has not reported a decrease in annual sales or annual gross revenue in the last 21 years. Total sales per capita have increased 70 per cent in 10 years, thus reflecting a growth of sales per customer as well as an increased number of customers.

The present year has brought to gas men in America the keen realization that out of scientific research wisely planned and courageously prosecuted will develop a gas industry undreamed of 10 years ago.

The extent to which gas service, both manufactured and natural, has captured the domestic cooking business of the nation, is strikingly revealed in figures recently made public as the result of a country-wide survey.

Of the 27,850,000 families residing in the United States, 12,970,000 cook with manu-

(Continued on Page 38)

Shreveport Meeting Opens New Year *for* Southwest

Henry C. Morris will preside at the natural gas sessions to be held in Shreveport, La., January 14 and 15

By HENRY C. MORRIS

Vice-Chairman, Natural Gas Department, American Gas Association

THE rushing tide of natural gas developments in the Southwest has brought a large number of problems which are peculiar to this section. It might be stated as a general formula that the situation in this section in reference to market and supply is an exact reversal of conditions in the North and East. Here the problem is not one of supply but of market; there the problem is one of supply rather than market.

A glance at some of the items on the program which is now in the process of construction for our annual Southwestern meeting at Shreveport, Louisiana, January 14 and 15, will indicate at once the nature of some of these problems.

TRANSMISSION

The first group of these problems is included under the general term "transmission". It is natural because of the remoteness of many fields in the Southwest and the vast area which is included in this section and the sparse population of much of this territory that the long distance transmission of this fuel which nature has supplied us so abundantly would present outstanding difficulties. Consequently it is seen that much of our program is taken up with questions involving transmission.

Proper casing of wells, economic problems of high pressure gas transmission, leakage from high pressure lines are among some of the transmission topics which will be discussed.

We are fortunate this time, as we were at the natural gas department meeting in Dallas last May, in the prospect of having a discussion by P. McDonald Biddison, formerly general superintendent of the Gas and By-Products Company of Bastrop, Louisiana. His subject is "Economic Problems of High Pressure Transmission." By an arrangement with the Louisiana section of the American Society of Mechanical Engineers which is meeting in Shreveport simultaneously with our convention, we expect to have a discussion from Mr. Biddison on this question. The paper may include some observations on the maximum economic pressure limits for which long distance lines can be designed. Mr. Biddison is now consulting engineer at Monroe, Louisiana.

The proper casing of wells is always an uppermost consideration in this section. This topic will be handled by H. C. Otis of the Arkansas Natural Gas Corporation, Shreveport. His subject will be "Proper Casing and Tubing of Wells." William F. Chisholm, director of the Mineral Division of the Louisiana Conservation Commission, whose abilities as a public speaker and as an authority on gas conservation are well known and highly respected by the industry, probably will discuss some phases of this paper or will talk on another subject. At this writing we are not certain that Mr. Chisholm's duties will permit him to favor us but we are hoping that he can be with us.

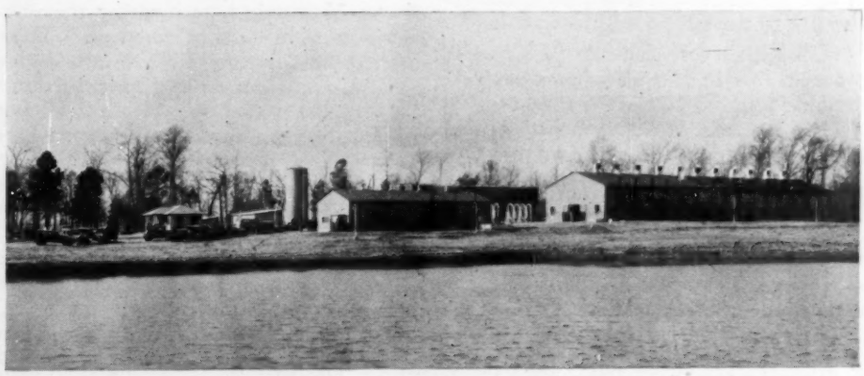
The United States Bureau of Mines at Bartlesville, Oklahoma, has just issued a bulletin on "Leakage from High Pressure Natural Gas Transmission Lines" by E. L. Rawlins and L. D. Wosk. This study reveals that loss of natural gas through leakage obtained runs into enormous figures. Such losses in one piece of line examined were estimated at $724,000 over a ten year period. The bureau states these losses could have been reduced to less than $100,000 by systematic leakage surveys. This indicates the importance of the subject and it will receive due attention at the convention.

The Bureau of Mines will not be officially represented on the program, because of the length of time necessary to have papers from this government agency approved at Washington, but it is planned to have a discussion from some member of the Bureau. It is probable that Mr. Rawlins will appear.

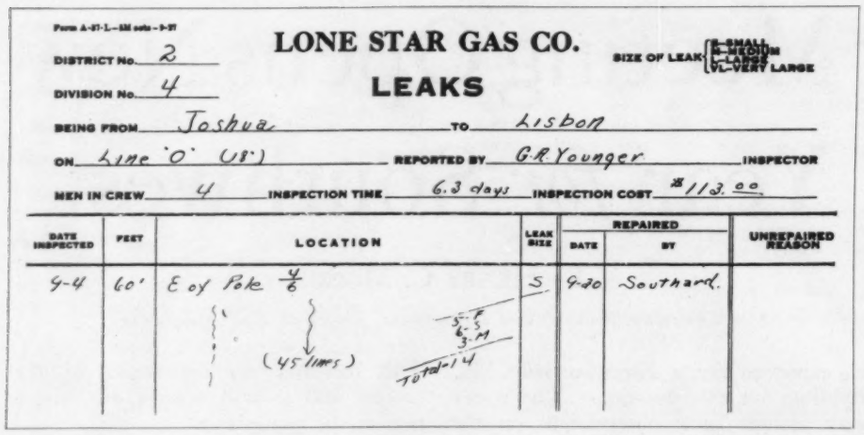
Leaving the problems of transmission, we find that the question of proper distribution systems for small towns is of especial importance in the Southwest because of the great number of villages which are now coming onto the lines in this section. Scores of small towns, especially in Texas, within the last few months have received natural gas for the first time. These towns go down as low as 35 meters. It is at once seen that the question of an economic distribution system for such communities is of vital importance. These problems will be handled under the title "Ideal Distributing Systems for Communities of 250 to 1500 Meters." The paper has been assigned to Chester L. May of Dallas, superintendent of the Community Natural Gas Company, a subsidiary of the Lone Star Gas Corporation. Mr. May's experience fits him admirably to discuss the question.

Another problem confronting the industry in the Southwest is the proper classification of accounts and in this we

(*Continued on Page 52*)



One item on the Shreveport program will probably be a barbecue at the Waskom compressor station of the Dixie Gulf Gas Company, shown above.



LONE STAR GAS CO.

LEAKS

DISTRICT No. 2 DIVISION No. 4 SIZE OF LEAK: S-SMALL M-MEDIUM L-LARGE VL-VERY LARGE

BEING FROM Joshua TO Lisbon

ON Line "O" (18") REPORTED BY G.R. Younger INSPECTOR

MEN IN CREW 4 INSPECTION TIME 6.3 days INSPECTION COST $113.00

DATE INSPECTED	FEET	LOCATION	LEAK SIZE	REPAIRED DATE	REPAIRED BY	UNREPAIRED REASON
9-4	60'	E of Pole 4/6 (45 lines) S-5 M-4 Total-14	S	9-20	Southard.	

Fig. 1

LEAKAGE RECORDS play a large part in the Lone Star Gas Company's continuous campaign against gas losses. Mr. Martin in the accompanying article offers a complete description of the method of leakage accounting which is producing such satisfactory results on the Lone Star system.—EDITOR

Leakage Accounting--*A* Potent

By J. A. MARTIN

IN this day of fixed prices and rampant production costs pertaining to that most essential industrial and domestic commodity, natural gas, probably the most potential factor in widening the margin between cost and return is the prevention of leakage.

The actual repairing of a leak is, of course, the main consideration, but the most important means to this end may be expressed in the one word "records." These records must embody as chief characteristics elasticity and comprehensibility. The nature and elaborateness of the records depend, of course, on the size of the system, but it has been our experience that systems are prone to expand; therefore the record system must be elastic. Next it must be comprehensive. This, in its broader sense, means that records must be quickly and easily readable in order to control the following elements:

(A) Time element. (To expedite repairs.)

(B) Opportunity element. (To determine when a line can best be spared in case a shut-down for repairs is necessary.)

(C) Repair cost element. (To weigh probable loss in leakage against loss in draining line and cost of repairs.)

(D) Locating cost element. (To establish time and cost standard for the inspection of any particular division.)

In our attempt to evolve a system of records which would have these characteristics it may be that we record some superfluous data, which the following detailed description may bring out.

It might be well, as a preface, to give a brief description of our "dispatchers board." This is a system map on a built-up soft pine board eight feet by 10 feet in size. The pipe lines are shown by radio insulation material known as "spaghetti," which may be obtained in red, black, green, and yellow, and used for legend. The lines are fastened to the board with map pins, also obtainable in colors, which besides fastening lines in place, represent fittings as follows:

White indicates an open gate valve. Red, a closed gate valve.

Green, a regulator.

Blue, operating through a by-pass.

On taps and gathering lines a black pin represents a positive meter and a barred pin an orifice meter.

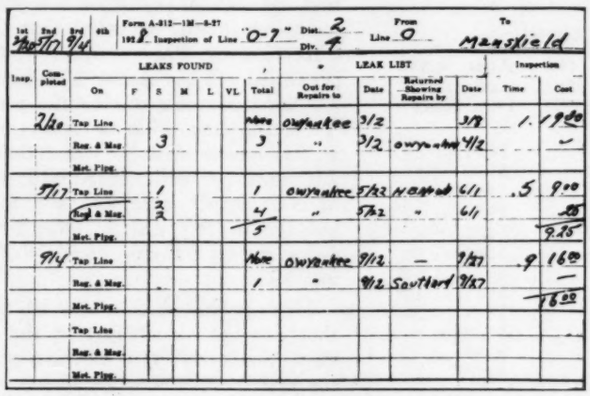
We also use a ring-topped pin which holds a tab, on which is shown telephone pole number, which gives definite location and mileage to any point on the system. This map, with tap lines shown coming off between main line gates, is a positive means of determining affected points in case of shutting down a section of line for repairs, etc.

The map also shows the boundaries of our 16 districts, each under the supervision of a district foreman. The districts are in turn divided into divisions varying from six to 12 per district. These districts and divisions are allotted among eight inspection crews, each crew having territory requiring about 90 days to cover (approximately 350 miles). It is our aim to make four complete inspections each year.

An inspection crew consists of three to five men and a foreman. Fittings above ground are inspected by "soaping" and inspection on buried lines is made by barring, that is, by sinking a bar to the top of the pipe at intervals of seven steps on the theory that gas from a leak in intervening space will travel along the line to and up through the bar hole. The foreman follows in the wake of the crew, lines up bars to keep on pipe line, applies a match to each bar hole and when a leak is found writes up location and size of leak. The size of the leak is indicated by the height of the flame at the bar holes. Leaks are classified as flash (F), small (S), medium (M), large (L), or very large (VL).

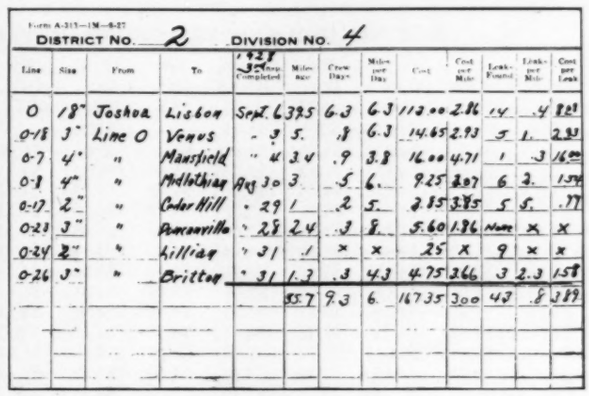
In case a large or very large leak is found he reports immediately by telephone and a repair crew takes immediate action. The search for leaks by inspection crews is independent of and in addition to that of a force of about 75 linewalkers, who cover the system on an average of every two days, but who look only for surface indications.

When the inspection of a division has been completed it is written up on a leak sheet in triplicate. The pink copy, or work sheet, goes at once to the district foreman. The original and yellow copy is sent to the office where the yellow copy is filed in the "Reported" file, and the original goes to the record clerk, who, after carding the data thereon, mails it to the district foreman. The foreman copies on it the repairs from the pink copy or work sheet as, and when made. The pink copy having been used as a work sheet is generally soiled and shopworn. If, within 20 days after mailing, the original has not been returned, showing repairs made, a first tracer is sent out, and 10 days thereafter a second tracer. These tracers are



Insp.	Completed	LEAKS FOUND: On	F	S	M	L	VL	Total	LEAK LIST: Out for Repairs to	Date	Returned Showing Repairs by	Date	Inspection: Time	Cost
2/20		Tap Line						None	owyuatee	3/2		3/7	1.	19.00
		Reg. & Mag.		3				3	"	3/2	owyuatee	4/2		—
		Met. Pipe												
5/17		Tap Line		1				1	owyuatee	5/22	Weaver	6/1	.5	9.00
		Reg. & Mag.		3 2				4	"	5/22	"	6/1		.25
		Met. Pipe						5						9.25
9/14		Tap Line						None	owyuatee	9/22	—	9/27	.9	16.00
		Reg. & Mag.						1	"	9/22	Southard	9/27		—
		Met. Pipe												16.00
		Tap Line												
		Reg. & Mag.												
		Met. Pipe												

Fig. 2



DISTRICT NO. 2 DIVISION NO. 4

Line	Size	From	To	1927 Date Completed	Miles	Crew Days	Miles per Day	Cost	Cost per Mile	Leaks Found	Leaks per Mile	Cost per Leak
0	18"	Joshua	Lisbon	Sept. 6	39.5	6.3	6.3	112.00	2.84	14	.4	8.00
0-18	3"	Line 0	Venus	" 3	5.	.8	6.3	14.65	2.93	5	1.	2.93
0-7	4"	"	Mansfield	" 4	3.4	.9	3.8	16.00	4.71	1	.3	16.00
0-8	4"	"	Midlothian	Aug 30	3	.5	6.	9.25	3.07	6	2.	1.54
0-17	2"	"	Cedar Hill	" 29	1	.2	5.	3.85	3.85	5	5.	.77
0-23	3"	"	Duncanville	" 28	2.4	.3	8.	5.60	1.96	None	x	x
0-24	2"	"	Killiam	" 31	.1	x	x	.25	x	9	x	x
0-26	3"	"	Britton	" 31	1.3	.3	4.3	4.75	3.66	3	2.3	1.58
					55.7	9.3	6.	167.35	3.00	43	.8	3.89

Fig. 3

Factor *in* Operating Economy

Supervisor Transportation and Maintenance, Lone Star Gas Company

appropriate form letters. When the original, with repairs shown, is returned to office the yellow copy is taken from reported file, attached to original, and filed in the repaired file. That particular division is then considered to be in good order until the next inspection.

The data are shown on the leak sheets, as illustrated in Figure 1.

"Tap" cards record the data as shown in Figure 2. This card is good for a year, having space for four inspections. It comes in three colors: Blue indicates company retailing plants; salmon, wholesaling to foreign retailing plants; and yellow indicates gathering lines. It gives a comparison of condition and inspection cost on lateral lines. The data hereon are carried over onto division cards shown in Figure 3. This card is for division of main line and taps thereon, and from it we get the "miles per day," "inspection cost per mile," "leaks per mile," "cost per leak," etc. for one complete division. The inspection time, shown in days and tenths of days (one hour) in the "crew days" column, divided into miles, gives miles per day. Miles into cost of inspection gives inspection cost per mile, which is the important figure with regard to inspection. The value of this indicator is reflected in the decreasing cost per mile of inspection, as shown in inspection statistics, hereinafter set forth. The leaks per mile, leaks found divided by miles, reflects the effectiveness of work done by repair crews, and also readily indicates the trend of leakage on any particular division, thus showing where to direct special effort to reduce general average of leak rate.

The cost per leak column is of doubtful worth, but might be construed to indicate when an inspection can be profitably skipped, as in the case where the cost per leak to locate, exceeds the probable cost to drain and repair section of line. All of the above, of course, applies to the district card, which shows all divisions of a district as a whole, and also on the system card on which all districts are incorporated, first for each quarter and finally for the year.

Complete statistics on leak prevention operations are given quarterly to all district foremen and inspection crew foremen, which creates considerable rivalry, reacting very satisfactorily for decreasing leak loss, as each foreman can see how the results of his efforts compare with those in charge of other districts. It may appear to some that this system is too elaborate, but due to the control it has given in the two years it has been used by us, not a single leak sheet has been lost, and the necessity for sending out second, or even first tracers, is comparatively rare. The saving realized on inspection costs alone amounts to more than the cost of the record system, but the chief consideration, of course, is the reduction of leakage accomplished through close touch necessary to expedite repairs. This is borne out by the following statistics.

The figures supporting this analysis are the results of very carefully kept records, have been carefully checked, and I am sure they are dependable for all districts, with the exception of the recently acquired West Texas system, in which case we can only call them approximate. I have left this district out of 1927 calculations, except for comparative purposes, but include it in 1928, and while it is grealy improved, as shown by the first 1928 inspection, it places a handicap of nine-tenths of a leak per mile over the entire Lone Star System. This handicap will be overcome by greater effort to prevent leakage during the ensuing year.

As the location of leaks naturally precedes the actual repair work, I present in Table No. 1 a comparative record of the cost per mile for inspection, shown by districts, quarterly for 1927 with average for the year, and the first 1928 inspection:

Please note that the average cost for the year for the entire system was $5.15 per mile. As the first 1928 inspection shows $4.10 per mile, there is a decrease in cost of $1.05 per mile or about 26 per cent. But probably a better comparison would be the first 1927 inspection, as conditions were presumably the same. This shows that 1st inspection of 1927 was $5.57, first inspection of 1928 was $4.10, or a decrease in cost of $1.47 per mile, amounting to about 27 per cent. This saving can be attributed to greater effort and efficiency, and the practice of keeping the same inspectors on the same territory, thereby reducing lost motion in prospecting for lines.

In conclusion, with reference to the inspection work, I believe the reduction of inspection cost should not be the sole aim. The sacrifice of careful inspection for speed will show up in increased leakage. A reduced number of leaks reported on districts where leakage is increasing means leaks are being overlooked. The 2.2 leaks per mile in 1927 and 1.9 leaks per mile on first 1928 inspection, com-

TABLE NO. 1—COST PER MILE FOR INSPECTION

District No.	1st Qtr. 1927	(Qtr.) (1928)	2nd Qtr. 1927	(2nd) (Qtr.) (1928)	3rd Qtr. 1927	(3rd) (Qtr.) (1928)	4th Qtr. 1927	(4th) (Qtr.) (1928)	Aver- age 1927	(Aver- erage) (1928)
1-A		($5.73)		($4.18)		($4.21)				
1	$5.43	($4.34)	$5.60	($3.88)	$5.08	($3.96)	$4.26		$5.09	
2	$6.08	($3.82)	$5.32	($3.66)	$5.00	($4.34)	$4.75		$5.29	
3	$9.63	($4.22)	$4.05	($4.06)	$5.41	($4.34)	$4.67		$5.94	
4	$5.02	($3.62)	$4.54	($3.71)	$5.32	($3.72)	$4.71		$4.90	
5	$5.97	($5.84)	$5.76	($5.07)	$5.95	($5.45)	$5.32		$5.75	
6	$6.60	($4.46)	$5.86	($4.23)	$4.70	($4.14)	$5.38		$5.64	
7	$6.95	($4.49)	$5.90	($4.30)	$6.42	($5.06)	$5.39		$6.16	
8	$4.36	($4.18)	$3.96	($3.55)	$5.46	($4.25)	$4.43		$4.55	
9	$5.10	($4.49)	$4.15	($3.91)	$6.56	($4.92)	$5.86		$5.42	
10	$4.43	($4.23)	$3.56	($4.03)	$4.40	($5.60)	$4.53		$4.23	
11	$3.68	($3.04)	$3.20	($3.90)	$6.10	($5.56)	$4.97		$4.49	
12	$3.72	($4.15)	$4.36	($3.69)	$4.40	($3.79)	$3.64		$4.03	
**13		($2.55)		($3.19)		($2.83)				
*14		($3.57)		($2.67)		(**)				
***15						($4.23)				
Total	$5.57	($4.10)	$4.87	($3.90)	$5.17	($4.37)	$5.03		$5.15	

* District 13 and 14 are new districts, first inspected on first Quarter of 1928.

** Third quarterly inspection of 1928 on District 14 was "Skipped."

*** District No. 15, taken from District No. 12, and first inspected as a unit, on the third Quarter of 1928. District No. 16 taken out of District No. 2, will be inspected as a unit on the fourth Quarter of 1928.

pared with actual leakage for corresponding time proves that the first 1928 inspection can be termed "careful."

To give a more vivid picture of the very expensive leakage problem I have converted individual leak loss into terms of dollars and cents as follows:

There were reported by inspectors in 1927 a total of 13,027 leaks, and by line-walkers 1,771 leaks or a total of 14,798 leaks reported in 1927. The gas measurement department shows the actual loss in cubic feet to be 1,146,-719,000 from which I deducted 4 per cent or 45,868,000 cubic feet of loading new main lines and taps. This leaves 1,100,851,000 cubic feet actual loss through 14,798 leaks, or 74,000 cubic feet per leak, which computed at 15c per thousand feet, makes an average loss per leak of $11.10. As this figure is of basic importance in the following computations, I wish here to record that it has been verified by a number of authorities.

Table No. 2 is a record of leaks per mile by districts, quarterly for 1927 with average for the year, and the first quarterly inspection of 1928.

You will note that district No. 1-A, being a newly acquired system, shows remarkable improvement. The 1927 rate of 26.5 leaks per mile is approximate but the 9.0 leaks per mile shown on the first inspection of 1928 are based on the actual mileage of 258.6 miles. This district shows a reduction of 17.5 leaks per mile during the short time we have had this system.

District No. 1 shows slight increase in leaks per mile, but as district No. 1 and 1-A are under one district foreman, the slight gain of leakage on district No. 1 is due to concentrated effort to reduce leakage on district No. 1-A, which resulted in the above mentioned 17.5 leaks per mile decrease.

District No. 2 shows neither gain nor loss, with an average for 1927 of 1.7 leaks per mile and the same on the first 1928 inspection. This is our largest district and it would take a considerable number of leaks, either more or less, to effect this average. Moreover, in this district we have considerable line on which we have been unable to make needed repairs without interrupting service.

District No. 3 shows the greatest number of leaks per mile, having an average for 1927 of 10.8 and for the first quarter of 1928 of 8.0 leaks per mile, but it will be noted that the first inspection of 1927 showed 15.0 leaks per mile. This means a reduction of 7.0 leaks per mile during the past year. To bring out what a reduction such as this means in dollars and cents, take 7.0 leaks per mile at $11.10 per leak or $77.70 per mile and for the total mileage in this district, which is 66.7 miles, means a saving of $5,182.59 during 1927.

Districts No. 4, 5, 6 and 10, although they are the oldest part of the system, show the lawest rate of leaks per mile; the rate for No. 4 is 1.1 leaks per mile; No. 5 shows 1.8; No. 6 shows .8; and district No. 10 shows 1.1. These districts are considered to be in better condition now than they have ever been.

District No. 7 shows an increase in leaks per mile through 1927 and on first inspection of 1928. There has been a change in supervision on this district and we expect improvement in 1928.

District No. 8 shows increase in leaks during 1927, ending with 4.8 leaks per mile on the last quarter, but a special effort reduced this to .9 of a leak per mile, as shown on the first 1928 inspection. This means a decrease of 3.7 leaks per mile, or in money $41.07 per mile. Practically the same thing happened in district No. 9 except that the reduction was from 9.7 leaks per mile on last inspection of 1927 to 5.0 leaks per mile on first inspection of 1928, a decrease of 4.7 leaks per mile, or in money $52.17 per mile.

District No. 11 increased from an average for 1927 of 2.0 leaks per mile to the 3.5 leaks per mile shown on the first 1928 inspection. This was due

TABLE NO. 2—LEAKS PER MILE

District No.	1st Qtr. 1927	(1st) (Qtr.) (1928)	2nd Qtr. 1927	(2nd) (Qtr.) (1928)	3rd Qtr. 1927	(3rd) (Qtr.) (1928)	4th Qtr. 1927	(4th) (Qtr.) (1928)	Aver- age 1927	(Aver- erage) (1928)
1-A		(9.0)		(7.5)		(6.1)			*26.5	
1	1.6	(1.9)	1.7	(1.2)	2.2	(.6)	1.1		1.7	
2	1.7	(1.7)	2.0	(1.9)	1.7	(1.4)	1.5		1.7	
3	15.0	(8.0)	12.6	(7.7)	10.0	(3.2)	5.4		10.8	
4	1.3	(1.4)	1.0	(1.5)	.7	(1.)	1.2		1.1	
5	2.2	(2.9)	1.8	(1.8)	1.6	(1.)	1.5		1.8	
6	2.2	(1.2)	.8	(1.8)	.5	(.5)	.6		.8	
7	3.0	(3.4)	2.0	(1.5)	2.9	(1.)	3.0		2.7	
8	1.6	(.9)	3.6	(6.2)	4.7	(2.7)	4.8		3.7	
9	5.5	(5.0)	4.3	(5.4)	8.5	(1.1)	9.7		7.0	
10	2.0	(1.4)	1.0	(2.3)	1.0	(2.1)	1.3		1.4	
11	1.1	(3.5)	1.9	(4.2)	2.9	(2.8)	1.9		2.0	
12	1.2	(.9)	1.1	(1.2)	1.2	(2.7)	.8		1.1	
13		(3.7)		(3.6)		(3.2)				
14		(1.3)		(.3)		Skipped.				
15						(1.4)				
All Districts	2.2	(*2.8)	2.0	(2.6)	1.9	(1.9)	1.8		2.0	

(*) A total of 6,870 leaks.

* This figure is reduced to 1.9 when one newly acquired system is excluded.

mainly to lines taken over by the company. For example, one such system showed 17.9 leaks per mile.

District No. 12 shows the low 1927 average of 1.1 leaks per mile, and was further reduced on the first 1928 inspection to .9 leaks per mile.

District No. 13 and 14 are new districts and are starting 1928 with 3.7 leaks per mile on district No. 13 and 1.3 leaks per mile on No. 14.

The leak per mile rate for the entire system for 1927 was 2.2, and for the first 1928 inspection 2.8. This is an increase of .6 leaks per mile, but this includes one newly acquired system. If we exclude this system the first inspection of 1928 would show 1.9 leaks per mile, or a decrease of .3 leaks per mile.

Table No. 3 is intended to call attention to a very important factor in the leakage question, one which, in many cases, does not receive due consideration, namely, the cost to drain lines for repairs.

TABLE NO. 3—COST TO DRAIN LINES FOR REPAIRS

Line Size	Cubic feet per mile in thousands at 260 lbs.	Money cost at 15c per M cubic feet	Add 25% for blowing line	Total cost per mile to drain
2 In.	2.2	.34	.08	.42
3 In.	5.1	.76	.19	.95
4 In.	8.7	1.31	.33	1.64
6 In.	19.8	2.97	.74	3.71
8 In.	34.4	5.16	1.29	6.45
10 In.	54.1	8.11	2.03	10.14
12 In.	77.7	11.65	2.91	14.56
14 In.	94.7	14.20	3.55	17.75
16 In.	125.0	18.75	4.69	23.44
18 In.	161.0	24.15	6.04	30.19

According to the table shown on page 351 of the Natural Gas Hand Book, one mile of 16 inch line, which is about our average main line size, at 260 pounds pressure, which is a fair average for pressures maintained over the entire system, contains 125,000 cubic feet, which computed at 15c per thousand is $18.75 per mile. For blowing line after repairs are made 25 per cent or $4.69 should be added, making a total cost of $23.44 per mile to drain a 16-inch line for repairs. If a 10-mile section is drained the approximate cost of the gas wasted is $234.40, which means that in order to balance this loss we should repair the equivalent of 21 leaks at $11.10 per leak. As to what the equivalent of 21 leaks is we, of course, must leave to the judgment of the district foreman.

In regard to cost for repairs, the accounting department shows that $134,000.00 was expended in 1927 for repairing leaks, replacing pipe, and filling washes. Assuming that all of the 14,798 leaks reported in 1927 were repaired, the average cost to repair one leak was $9.06. With reference to this figure, I believe there is a general effort all over the system to reduce repair costs.

There has been from time to time some speculation as to the return on money expended for linewalkers. If we ignore the fact that the leaks reported by linewalkers, to be apparent without bar-testing, are necessarily much larger than those reported by inspectors, and if we ignore the fact that linewalkers do other work such as changing charts, reading meters, caring for material on right of way, helping repair leaks, keeping vegetation and trash from around telephone poles, meter houses, etc., thereby reducing fire hazards, and just look upon them in the light of insurance or protection we find that as the investment per mile of pipe is about $12,300 the $4.50 per day paid the linewalker is a very low premium on the $147,600 of company property he guards on the average 12-mile beat.

Table No. 4 is a comparison by districts quarterly for 1927 with average for the year, and first 1928 inspection showing money loss due to leakage. By the simple process of multiplying money loss per leak by leaks per mile, and the result by the miles in the district, we have the result in dollars and cents, as shown in Table No. 4 below.

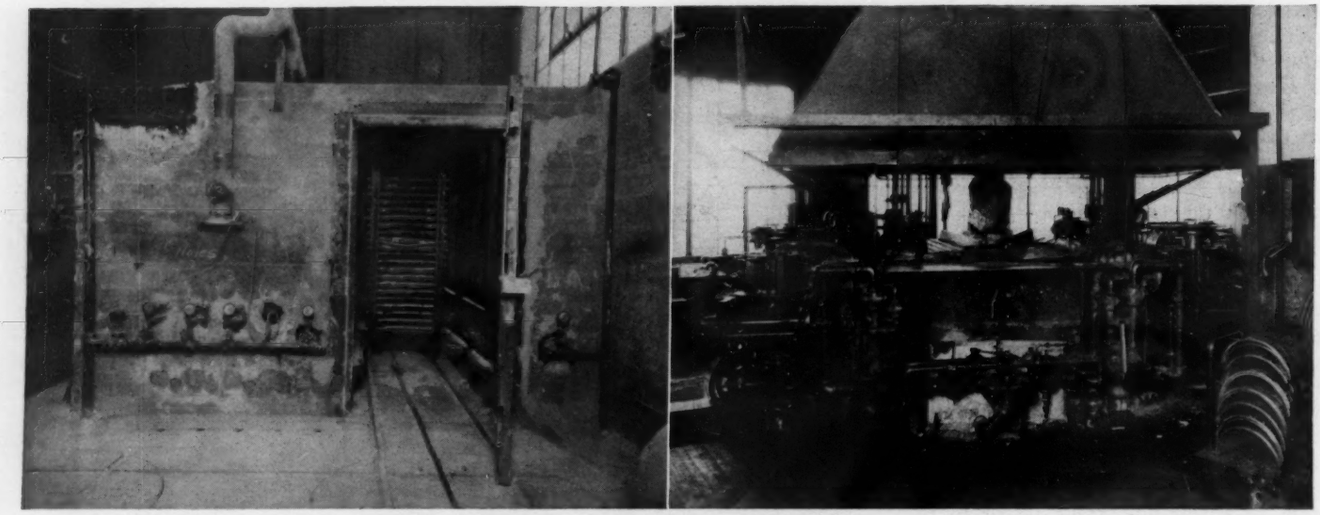
TABLE NO. 4—VALUE OF LEAKAGE LOSS, 1927-1928

District Number	First Quarter 1927	(First) (Quarter) (1928)	Second Quarter 1927	(Second) (Quarter) (1928)	Third Quarter 1927	(Third) (Quarter) (1928)	Fourth Quarter 1927	(Fourth) (Quarter) (1928)	Total 1927
1-A		($25,834.14)		($19,330.65)		($16,114.98)			$ 76,067.19
1	2,573.42	(3,481.96)	2,868.24	(2,340.32)	3,660.56	(1,223.44)	1,853.48		10,655.70
2	5,934.61	(10,455.87)	7,215.00	(11,888.43)	6,340.32	(10,194.24)	7,039.62		26,529.55
3	7,742.50	(5,922.96)	6,503.49	(5,726.49)	5,161.50	(2,823.84)	4,201.79		23,609.28
4	2,900.43	(4,778.55)	2,430.90	(5,176.48)	1.701.63	(3,535.35)	3,748.25		10,781.30
5	5,286.93	(4,503.38)	3,796.20	(4,479.52)	2,379.84	(2,496.39)	2,297.70		13,760.67
6	5,238.09	(3,503.16)	2,142.85	(5,768.22)	1,306.47	(1,657.23)	961.04		9,648.45
7	1,914.75	(2,611.61)	1,276.50	(1,152.18)	1,850.93	(768.12)	1,981.35		7,023.53
8	683.76	(335.66)	1,538.46	(2,312.35)	2,008.54	(1,006.99)	2,051.28		6,282.04
9	824.17	(4,312.35)	548.89	(4,657.34)	1,179.38	(667.89)	2,960.92		5,513.36
10	3,041.14	(1,973.58)	1,520,70	(3,604.84)	1,184.37	(2,568.76)	1,802.31		7,548.52
11	1,831.50	(6,674.43)	3,205.68	(7,818.17)	5,295.26	(5,392.38)	3,469.31		13,801.75
12	965.70	(1,294.37)	1,258.88	(2,406.93)	2,129.87	(1,735.26)	1,556.66		5,911.11
13		(4,801.08)		(4,691.30)		(4,681.54)			
14		(1,294.37)		(314.59)		(2,494.17)			
All 15 Districts	$39,242.94	($81,470.00)	$36,563.34	($81,667.85)	$34,819.59	($58,853.75)	$33,946.02		$146,593.26

Note: The 1928 figures are based on the 1927 "Cost per leak" rate, and are subject to correction when 1928 "Cost per leak" has been established.

The above computations may be verified as follows:

Leakage loss in 1927: 1,100,851,000 cubic feet @ 15c per thousand		$165,127.65
Reported by inspectors in 1927, 2 leaks per mile, 6,603 miles, @ $11.10 per leak	$146,593.26	
Reported by linewalkers in 1927, ¼ leak per mile, 6,603 miles @ $11.10 per leak	18,324.17	
		$164,917.43



LEFT: Showing outlet end of 60-foot kiln for drying filter cake; kiln is heated by direct gas fire. RIGHT: Stereotype gas burner equipment under double pots; capacity 16,000 pounds metal.

Some *of the* Requisites *in* Selling Gas *for* Industrial Uses

By J. H. GUMZ

Industrial Gas Engineer
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ONE of the obstacles encountered by every industrial gas department and also by individual sales engineers in the endeavor to sell gas for industrial purposes is the difficulty in securing accurate and authoritative data for such usage. This lack of information leads to much duplication of effort and often results in mistakes being made. Duplication of effort and mistakes are to be regretted, but one possible result of mistakes is perhaps more important than the mere making of the mistake. Mistakes provide material and propaganda for the exponents of competitive fuels to say: "I told you so", or, "It can't be done with gas". The reason for this lack of information is, of course, that the sales engineers and the salesmen are satisfied in knowing that a job is well done and the fact is overlooked that the imparting of knowledge gained through individual effort and experience would benefit the industry as a whole and save others from making mistakes because of their lack of knowledge.

J. H. Gumz

The sale of gas for industrial purposes invariably involves a detailed study of a technical nature before the prospect can be sold. However, when a prospect has been successfully closed the salesman when talking and writing about it overlooks the technical end as being boresome and tells merely of the results accomplished and stresses the over-all fact that gas has again proved that "When heat is used you can do it better with gas". Technical details are not boresome to the sales engineer who is trying to solve a similar problem. Oftentimes gas sales engineers may be in a quandary as to whether a prospect should be sold new stock equipment or if plans should be furnished from which he can build his own equipment, or whether existing equipment should be converted to gas. It requires considerable ability on the part of the salesman to accurately judge a prospect and to determine the best course of procedure. It is human nature to follow what appears to be the easiest course and it is often found that this is the wrong one.

Comments on a few installations that have been made may be of interest and will illustrate how circumstances and conditions determine just what is to be done.

A paint manufacturer of national scope produces lead arsenate as one of his products. One of the final steps in the production of lead arsenate is to remove the moisture contained in the filter cake after it comes from a filter press. This particular manufacturer was drying the cakes by passing them through a tunnel drier heated with steam coils in the kiln and at the air intake a bank of steam coils heated the air which was drawn through the kiln to carry off the moisture. It was possible to obtain a temperature of approximately 250° F. and a maximum production of about 5,000 pounds of dried product every 24 hours. A 150 H. P. oil-fired steam boiler furnished the steam at a total cost of about $775 per month for fuel and labor and exclusive of interest, maintenance, insurance, etc.

It was desired to double the production and naturally the question at once arose as to the investment necessary to insure the increase. A second tunnel kiln would have been needed if the existing method of drying were used. Additional fuel would also be needed with possibly an increase in boiler capacity. Tests established the fact that temperatures as high as 450° were not harmful to the product and it was suggested that direct gas heat in the kiln with the higher temperature would probably speed up drying enough so that

(*Continued on Page 36*)

Long Distance Transmission

A Presentation *to the* World Fuel Conference, London, England

By HOWELL C. COOPER

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AT the World Fuel Conference held recently in London the American gas industry was represented by the following paper, prepared by Mr. Cooper as a contribution from the American Gas Association. Presented to an audience more familiar with manufactured gas operations than with natural gas projects, the paper gives historical information on the background of long distance transmission as well transmission undertakings. Gas men in as a survey of the factors which condition both "manufactured" and "natural" branches of the industry will find interest in Mr. Cooper's discussion.—*Editor.*

THE purpose of this paper is to consider the principal matters which affect the financial results of any project involving the transmission of fuel gases over considerable distances through pipe lines.

The experience of the natural gas industry, as developed during the past fifty years in the United States, it is thought may be used advantageously as a basis for the consideration of these economic matters, because long distance transmission of a natural fuel gas is an essential part of the industry.

In 1872 a pipe line two inches in diameter was laid to the city of Titusville in Pennsylvania from natural gas wells five and one-half miles distant, and natural gas was transmitted and sold for fuel in the city. This undertaking marked the beginning of what has grown to be a great industry in America. At that period wells were being drilled throughout Western Pennsylvania, New York, Ohio, and West Virginia, in the search for oil, and since much natural gas was also found, the small enterprise at Titusville was soon repeated and enlarged upon as to other towns and cities throughout all this region. Buffalo, Pittsburgh, Cleveland, Youngstown, Cincinnati, and Toledo, all great industrial centers, were early supplied with natural gas as fuel through the agency of transmission pipe lines extending to them from distant wells, and they are still so supplied.

The pipe lines laid for transmitting natural gas in these states between the years 1872 and 1890 did not generally exceed about eight inches in diameter. The pipe was made of wrought iron and the joints connected with screwed couplings. The pressure in the pipe lines was carried at about eighty pounds. At that period the transmission pipe lines were not of great length because of the location of gas wells with reference to the cities supplied. In 1891, the Indian Natural Gas & Oil Co. laid two parallel pipe lines eight inches in diameter a distance of 120 miles from natural gas wells drilled near Greentown, Ind., to Chicago, Ill. The pipe was made of wrought iron, connected with screwed couplings, and the gas was transmitted under an initial pressure of 525 pounds. Mechanical compression was used. This enterprise marked the beginning of long distance high-pressure transmission in the United States.

Since that time considerable development in this industry of transmitting and marketing natural gas has taken place. Much gas has been found in California, Wyoming, Texas, Oklahoma, Arkansas, and Louisiana, and is being transmitted through systems of pipe lines as large as 22 inches in diameter, and under pressures of gas as high as 400 pounds. In the Eastern States these pipe line systems extend from Cleveland on Lake Erie, as far South as Kentucky and thus transmit natural gas for distances of 350 miles from wells to markets. In the Western States some pipe line systems are in excess of 400 miles in length. In this manner 1200 billion cu. ft. of natural gas were transmitted and marketed in the United States in 1927. It is from this background of experience that the following matters are presented.

The production of natural gas is essentially a mining operation, and because of the natural difficulties which surround such industries, it is necessary to assemble a large amount of proved and prospective gas bearing territory and place it behind any project involving marketing the gas as fuel for domestic or industrial purposes in order to secure a continuous supply of gas over a long period of time.

The development of this gas reserve with the necessary wells of exploration and those required for regular production, makes necessary a large investment of money and entails heavy fixed and operating charges. Therefore, to meet these charges, large volumes of gas must be sold yearly from the property, and this can only be done by marketing it as a fuel in competition with all other forms of fuel, namely, coal, oil, and manufactured gas.

In marketing natural gas from properties assembled as above described, it will be clear that the distance over which the gas may be transmitted is very definitely limited by the character of the market which it is proposed to supply. Thus a large yearly demand, coupled with a high daily load factor, and no unusually low prices for competitive fuel, will make economically possible the pipe line investment required to transmit the gas long distances. But on the other hand should any of these factors be unfavorable, transmission possibilities are materially affected.

In the following study these several factors wll be considered separately.

(A portion of Mr. Cooper's paper describing current construction practice followed in gas transmission is omitted at this point.—*Editor.*)

The investment in pipe lines and compressing machinery comprising the transmission facilities of any natural gas project is largely determined by the load factor of the whole market to be served. A first step, therefore, in determining the feasibility of transporting natural gas over a considerable distance consists in finding the maximum daily demand of the whole proposed market and also the total yearly sales for all purposes.

If gas is to be sold for all domestic uses—cooking, water heating, and house heating—a most careful study must be made to determine the maximum demand of this house heating load which will be placed on the transmision line on the coldest days in winter. An average domestic consumer in our Southern cities will require about 27,000 cu. ft. of natural gas per year for the two uses, cooking and water heating. In Northern cities this volume will be greater, possibly 30,000 to 35,000 cu. ft. The daily

demand for this purpose is fairly steady in a large city throughout the year.

The house heating demand, however, depends on the competitive prices of other fuels, and upon the average temperatures throughout the year. In a paper written by P. McDonald Biddison, entitled, "Limiting Factors for Natural Gas Projects," presented at the meetings of the American Gas Association at Dallas, Texas, May 7, 1928, the author states that studies which have been made by engineers covering some cities in our Southern states in which natural gas is used indicate that an average consumer in those particular cities uses about 16 cu. ft. of natural gas per day per degree of temperature below 65° F. for house heating.

On very cold days the demand of the whole domestic market in some cities may be 2½ times the volume of natural gas required for that class of business on the average day, using the whole yearly demand as a basis of comparison. And also on a cold day the domestic consumer using natural gas for house heating will, in many cases, require that 70 per cent of the whole day's demand shall be delivered to him between the hours of 7:00 a.m. and 7:00 p.m.

Experience shows that the duration of the cold season, the general character of the dwellings, the earning power of the consumers, and the price of competitive fuels, all have their effect on the volume of natural gas which each consumer will use per year, particularly for house heating, and also largely determine the number of people in any community who will so use the gas. As there is no way of valuing these several factors exactly, it is recommended that a study be made of a new market, when possible, by comparing it with those existing markets which present the same general characteristics.

Turning to the industrial market, the daily load factor may be high, if there are many and diversified manufactories served, or the same may be low if the reverse of these conditions obtains. It is, therefore, necessary to give the whole matter of total sales and peak demands of a market most careful study in analyzing a natural gas project for, as will later be illustrated, the cost of transmission in cost cases is vitally affected by the irregularity in market demand.

EFFECT OF LOAD FACTOR

The following illustrations, or examples, are here introduced to show in general the trend of changes in the investment required to be made and also the resulting operating costs, when natural gas is transported over distances varying from 75 miles to 300 miles, in volumes varying from about 9000 million to 26,000 million cu. ft. per year, and with daily load factors varying from 65 per cent to 100 per cent.

The design of pipe line, its diameter and power arrangements chosen for each of these illustrations, is in conformity with general engineering practice in the natural gas industry at the present time.

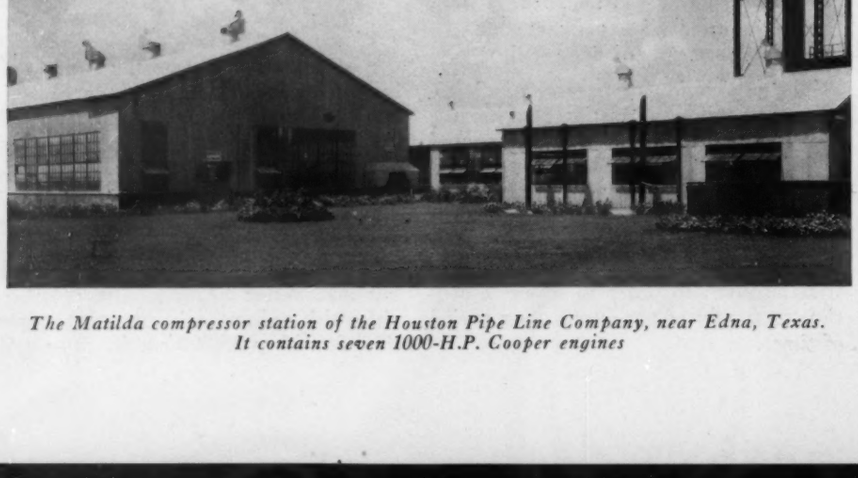
The investment cost used in the illustrations represents about average experience as of the present day in laying long transportation pipe lines across ordinary country where no unusual difficulties are to be met.

The item, "Total Yearly Cost Item," includes:

(a) Local field management and superintendence.
(b) Labor for maintaining, operating and repairing the pipe line and compressing stations.
(c) Fuel and supplies and spare equipment.
(d) Eleven per cent on the investment to provide for retirement of investment and interest on the capital at six per cent.

It does not include:

(e) General overheads and accounting.
(f) Interest on working capital.
(g) Taxes.
(h) Sum for unusual replacements.



The Matilda compressor station of the Houston Pipe Line Company, near Edna, Texas. It contains seven 1000-H.P. Cooper engines

TREND OF TRANSMISSION COSTS—NATURAL GAS

Illustration No. 1

Yearly volume delivery	9,490,000,000 cu. ft.
Average daily delivery	26,000,000 cu. ft.
Maximum daily delivery	26,000,000 cu. ft.
Load factor—daily	100%
Distance of transmission	75 miles
Diameter of pipe line	12 inches
Compressing station at field end of line	
No recompressing stations	
Investment—pipe line and station	$1,630,000
Total yearly cost, items (a) to (d) inclusive	276,000
Then, cost per M cu. ft. delivered	2.9 cents

Illustration No. 2

Yearly volume delivery	16,440,000,000 cu. ft.
Average daily delivery	45,000,000 cu. ft.
Maximum daily delivery	45,000,000 cu. ft.
Load factor—daily	100%
Distance of transmission	75 miles
Diameter of pipe line	16 inches
Compressing station at field end of line	
No recompressing stations	
Investment—pipe line and station	$2,210,000
Total yearly cost, items (a) to (d), inclusive	358,000
Then, cost per M. cu. ft. delivered	2.18 cents

Illustration No. 3

Yearly volume delivery	16,440,000,000 cu. ft.
Average daily delivery	45,000,000 cu. ft.
Maximum daily delivery	45,000,000 cu. ft.
Load factor—daily	100%
Distance of transmission	300 miles
Diameter of pipe line	18 inches
Compressing station at field end of line	
One recompressing station	
Investment—pipe line and stations	$9,080,000
Total yearly cost, items (a) to (d), inclusive	1,313,000
Then, cost per M. cu. ft. delivered	8 cents

Illustration No. 4

Yearly volume delivery	26,300,000,000 cu. ft.
Average daily delivery	72,000,000 cu. ft.
Maximum daily delivery	72,000,000 cu. ft.
Load factor—daily	100%
Distance of transmission	300 miles
Diameter of pipe line	20 inches
Compression station at field end of line	
Three recompressing stations	
Investment—pipe line and stations	$11,640,000
Total yearly cost, items (a) to (d), inclusive	1,832,000
Then, cost per M. cu. ft. delivered	6.96 cents

Illustration No. 5

Yearly volume delivery	9,490,000,000 cu. ft.
Average daily delivery	26,000,000 cu. ft.
Maximum daily delivery	40,000,000 cu ft.
Load factor—daily	65%
Distance of transmission	75 miles
Diameter of pipe line	14 inches
Compressing station at field end of line	
No recompressing stations	
Investment—pipe line and station	$2,060,000
Total yearly cost, items (a) to (d), inclusive	350,000
Then, cost per M cu. ft. delivered	3.69 cents

Illustration No. 6

Yearly volume delivery	16,440,000,000 cu. ft.
Average daily delivery	45,000,000 cu. ft.
Maximum daily delivery	70,000,000 cu. ft.
Load factor—daily	65%
Distance of transmission	75 miles
Diameter of pipe line	18 inches
Compressing station at field end of line	
No recompressing stations	
Investment—pipe line and station	$2,860,000
Total yearly cost, items (a) to (d), inclusive	472,000
Then, cost per M cu. ft. delivered	2.87 cents

Illustration No. 7

Yearly volume delivery	16,440,000,000 cu. ft.
Average daily delivery	45,000,000 cu. ft
Maximum daily delivery	70,000,000 cu. ft.
Load factor—daily	65%
Distance of transmission	300 miles
Diameter of pipe line	18 inches
Compressing station at field end of line	
Three recompressing stations	
Investment—pipe line and stations	$11,180,000
Total yearly cost, items (a) to (d), inclusive	1,800,000
Then, cost per M cu. ft. delivered	11 cents

Illustration No. 8

Yearly volume delivery	26,300,000,000 cu. ft.
Average daily delivery	72,000,000 cu. ft.
Maximum daily delivery	111,000,000 cu. ft.
Load factor—daily	65%
Distance of transmission	300 miles
Diameter of pipe line	22 inches
Compressing station at field end of line	
Three recompressing stations	
Investment—pipe line and stations	$14,350,000
Total yearly cost, items (a) to (d), inclusive	2,352,000
Then, cost per M cu. ft. delivered	8.9 cents

Since a transmission system, to meet the requirements of any particular project, admits a variation in design as to choice of pipe diameter, quality of pipe, operating pressures, number of recompressing stations and selection in type of

ONE MILE FROM Ventura, Calif., is located this plant of the Ventura Fuel Company, the largest gas compressing station on the Coast, pumping gas to the Los Angeles district some 65 miles to the south.

TEN FOUR-CYCLE, double-acting 760 B.H.P. Cooper gas engines make up the installation at this plant.

machinery, it is apparent that the cost figures presented in the foregoing examples, both for investment and operating charges, are to be accepted as illustrative only, and confined to systems designed in accordance with present day practice for lines of moderate length.

Considering the effect of daily load factor on the transmission costs, for a given yearly total delivery of natural gas over distances within the range of the illustrations, compare illustration No. 1 with No. 5; No. 2 with No. 6; No. 3 with No. 7; and No. 4 with No. 8.

The daily load factor of 65 per cent as used in these illustrations is high for markets consisting of both domestic and industrial consumers, when fully supplied with natural gas as fuel. To obtain a load factor as good as 65 per cent in this industry requires (a) that of the whole market served a very large percentage must be composed of well diversified industrial consumers, or (b) that during the mild seasons of the year, when domestic consumers use little fuel for house heating, gas must be sold in irregular but large quantities at low prices in competition with cheap fuels used for steam making, or in such employment as can accept irregular service.

It is apparent, therefore, that as the daily load factor becomes lower, the transmission costs, for any fixed yearly volume of delivery and over any fixed distance, will increase.

It may also be observed from the illustrations that in general large daily volumes of gas may be transmitted long distances at lower costs per M. cu. ft. than can be accomplished in cases where small daily volumes are to be thus transmitted.

Up to the present time natural gas has not been transmitted a greater distance from wells to markets than about 350 miles, except in those cases where the transmission system serves many markets intervening between the producing fields and the most distant markets.

The present day design of natural gas transmission systems using gas pressures not exceeding 400 pounds, as before described, and using pipe up to 22 inches in diameter with comparatively thin walls, and having the joints put together with couplings, has met the operating requirements of the natural gas industry in its development up to the present time. But as projects are arising in which it is required that natural gas shall be transmitted to mean distances of 450 miles, and greater, and upon delivery shall admit of sale in competition with coal and oil at their normal prices, we find that the further lengthening of pipe lines, with recompressing stations as needed by such extensions, will not meet the economic requirements of some of these projects. Therefore, thought is being given to the possibility of using still larger diameters of pipe for the purpose of keeping down the amount of power required in transmitting a given volume of gas over these long distances. It is of course necessary to analyze the specific conditions surrounding such projects individually to determine the effect upon total construction costs which would be brought about by the use of larger diameter pipe. Handling costs, ditching costs, river crossings, etc., all have to be considered in their relation to the character of the country through which the proposed project lies. The manufacturers also have to consider their problems in making pipe of larger diameters than those now in general use, and on the scale which would be required in very long lines. The character of the market to be served also enters each specific problem. Thus in some cases, if the market requires the delivery of a large volume of gas every day with great regularity, it may be found economical to make a large investment in the pipe and keep down compression investment, whereas, in other cases in which there are heavy peak demands for short periods, it may be found more economical to use a smaller diameter pipe line and supply power to meet these peak load requirements.

Engineers are considering also at this time the possibility of greatly increasing the pressure of the gas for very long distance transmission projects. If pressures are raised at the head, or field, end, of a long transmission line to 800 pounds, for example, in place of 400 pounds, less power for recompressing will be required in transmitting a given volume of gas per day through a pipe line of a given diameter. Or on the other hand, pipe of a small diameter could be used in the same service, provided recompressing is also used.

The obstacle to raising pressures to approximately 800 pounds in projects where large volumes of natural gas are to be transmitted over long distances lies in the fact that pipe in comparatively large diameters such as 18 inches or 20 inches must still be used to afford the necessary capacity. By the present methods of manufacture such pipe must be made from skelp and welded, and hence has a seam, and for that reason requires a large factor of safety in use, even though made of metal of rather high

The Palmer Corporation's compressor station at Elm Grove, Louisiana

tensile strength. Also a very carefully made and hence expensive coupling would be necessary in joining the pipe sections in a line to use such pressures, providing that type of coupling should be chosen.

At the present time much study is being given to the development of welded joints. The work which engineers are doing on the development of welding pipe joints may solve this part of the problem.

Therefore, before it can be determined in respect to any particular project whether or not the raising of pressures to, say, 800 pounds, will reduce transmission costs below those incurred by the use of 400 pounds, it will be necessary to solve the foregoing mentioned mechanical problems and find their resultant costs.

Consideration is also being given to seamless pipe of small diameter and the transmission through it of gas at pressures as great as 1,800 pounds. The sections of pipe of this diameter may be joined together by means of standard threads and couplings, and experiments indicate that when properly made up, these joints are very tight in holding gas under these pressures. Where the particular project involves the transmission of a very large amount of gas over a very long distance, the power required for such a high-pressure line is less than the power needed for transmission at low pressures, and the whole investment required in pipe line and compressing machinery appears, after careful study, to be much less than can be accomplished with present day methods of construction.

The foregoing considerations of the possibilities of high pressures are placed here only to show the trend of thought along which engineers are working to meet the advancing requirements of the industry.

At the close of this paper is given a general description of natural gas itself. It is thought that such a description would be interesting in cases where consideration is being given to the transmission of manufactured gas. It should be noted that natural gas in transmission is usually not fully saturated with water vapors, its compression and subsequent cooling before introduction into the transmission system having brought this condition about. It is also regular practice to extract any gasoline vapors from the natural gas before entering the pipe line. Therefore the problem of keping the transmission line free and clear of deposit is simpler in the case of natural gas than in the case of manufactured gas. This problem can only be met by carefully considering the proper location of drips in transmission lines for manufactured gas. It should also be noted that natural gas as produced in this country is in general free of constituents which would attack steel pipe, and this matter must be given consideration when transmitting any gas which does contain such constituents.

Since natural gas as at present produced contains in general 1,000 B.t.u. per cu. ft., it may in some cases be more economical in transmission than manufactured gas would be in similar circumstances. This would, however, be a matter for consideration in each particular project.

Manufactured gases are at present being transmitted over considerable distances through steel pipe lines constructed and operated in the same manner as is used in the transmission of natural gas and without any mechanical difficulties.

Natural gas is, for the most part, composed of hydrocarbons of the paraffin series. carbon dioxide, nitrogen, and helium. However, its composition varies considerably in the different American fields. Natural gas of the Eastern or Appalachian field is almost entirely made up of the hydrocarbons of the paraffin series. Natural gas of some parts of Kansas, Oklahoma, and Texas is very high in nitrogen and relatively high in helium content. Some of the natural gas of the Pacific Coast states contains large percentages of carbon dioxide. Natural gas in a few districts contains hydrogen sulphide and organic sulphur compounds.

The paraffin hydrocarbons found in natural gas are methane, ethane, propane, butane, pentane, hexane, heptane, and octane. The first four named hydrocarbons are gaseous under ordinary conditions of temperature and pressure. The last four hydrocarbons are normally liquid at atmospheric temperatures and pressure, and are the main components of natural gas gasoline. Methane is the predominating component of commercial natural gas and octane is the hydrocarbon which is present to the least extent.

The water vapor content of natural gas, as it is distributed, is always less than the amount required for saturation. Temperature and pressure conditions of transmission, and the necessity for elimination of line deposits, limit the content of water vapor.

Considerable quantities of the so-called "wet" or "casinghead" gas are derived at low pressure from oil wells. This gas usually contains vapors of the normally liquid hydrocarbons. This gas must be compressed and cooled or treated for natural gas gasoline recovery prior to its delivery into the transmission lines. The collection of condensates in lines is avoided by this procedure.

Hydrogen sulphide is present only in a very few of the gas fields of this country, but when present it must be removed so as to eliminate corrosion difficulties in compressing stations, pipe lines, and metering devices. The methods employed are the so-called: (a) "wet" method, wherein the gas is scrubbed with various solutions; (b) "dry" method, wherein the gas is passed through ferric oxide, or "lux," and (c) "oxidation" method, wherein the gas is treated with a quantity of air chemically equivalent to the hydrogen sulphide, and heated in the presence of a catalyst.

(On page 48 will be found a tabulation of typical analyses of commercial natural gas, prepared in connection with Mr. Cooper's paper.—*Editor.*)

Combining Public Relations *and* Sales Appeal *in a* Direct *by* Mail Experiment

By WALTER THURBER

Manager Publicity and Advertising Department, Southern Counties Gas Company

SOUTHERN COUNTIES GAS COMPANY
216 WEST SECOND STREET POMONA, CAL.

Pomona, California
November 15th, 1928

Dear Gas Consumer:—

This company is a corporation, its stock is held by men and women. The service you receive is rendered by men and women. And those for whom we provide service are men and women — all of us human, thinking much alike, needing about the same things, equally subject to human mistakes.

Our President — Mr. F. S. Wade — recently said, "Our definition of a public utility, as we apply it to our company, is this:

— An agency created to serve the public with an every day necessity in a quantity adequate at all times for all reasonable requirements, of a quality as good as modern methods can produce, at a rate as low as possible commensurate with the cost of quality and quantity production. The service to be rendered by the company to the public to be delivered at all times with the courtesy which obtains in the personal dealings of one individual with another."

We want to know from you personally through the enclosed pre-paid postcard whether the service we are giving YOU is all that you think it should be and all that we want it to be.

"How to Save on Your Gas Bill," is the subject of a helpful little booklet we have prepared for our customers. We want you to have a copy. It is free. You may order your copy on the enclosed card.

Have you given some thought to the improvements that appear in the newer models of gas ranges? They will appeal to you because of their beauty, their simplicity, the hours of kitchen work that they will SAVE and the better service they will give you at less cost for gas.

You will be interested in the special sketches of model kitchens on the next page of this letter. And I think you will be interested, too, in the special arrangements by which — for a short time — you may have one of these newer ranges in your own kitchen on a basis that is unusually attractive.

Yours very sincerely,

C. G. Spencer

C. G. SPENCER,
District Manager

P.S. We invite your attention to the artist's sketch on "Temper" on the next page.

Facsimile of letter imprinted upon gas company mailing piece.

AN experiment in customer contact—a combination public-relations and sales-promotion project—is being made by the Southern Counties Gas Company throughout its southern California territory. The test tube is a single mailing piece which has been sent, under first class postage, to approximately 90,000 domestic consumers of natural gas. The mailing piece consists of a four-page letter-size folder accompanied by a business reply postcard.

The first page of the folder takes the form of a letter signed by the district managers for their respective districts. The letter is devoted to a sincerely voiced injuiry about the quality of the service rendered by the company. "We want to know from *you,* personally, through the enclosed postcard, whether the service we are giving you is all that you think it should be and all that we want it to be", inquired the district managers over their respective signatures. This statement was coupled with a modern definition of a public utility by Mr. F. S. Wade, President of the company and an offer to send a free booklet on "How to Get the Best That Gas Can Give You."

Here is the definition of a public utility given by Mr. Wade, as he applies it to the Southern Counties Gas Company:

"An agency created to serve the public with an every day necessity in a quantity adequate at all times for all reasonable requirements, of a quality as good as modern methods can produce, at a rate as low as possible commensurate with the cost of quality and quantity production. The service to be rendered by the company to the public to be delivered at all times with the courtesy which obtains in the personal dealings of one individual with another."

The public-relations value of this letter was demonstrated at once. Ninety-one per cent of the replies were highly complimentary to the company's service. A church treasurer wrote, "the ——— Church hopes to give as good service to the people as the Southern Counties Gas Company does." Another customer, evidently a traveler, said: "From New Mexico to British Columbia I have never had better gas or better service". "Gas service good but my range needs adjusting", wrote another. "For eight years I have had satisfactory service in all ways", remarked another consumer, indicating at the same time his readiness to buy a new range.

Eight per cent of the replies voiced some unfavorable comment. Many of these were found to be based on old, worn-out appliances. In one town the replies revealed an unsuspected low-pressure area covering a few city blocks. The low pressure difficulty was solved immediately. Those whose complaints were provoked by worn-out appliances were interviewed by the company's sales representatives and in many cases were found ready to purchase modern equipment. The few who complained about rates were given courteous information regarding the rate structure and the reasons for it. Each complaint received by the company was handled promptly through a personal visit. Those consumers who were complimentary in their comments received a note of appreciation from the district manager. Those who asked for the booklet received it on the next mail with a friendly note from the office. Those who inquired about modern gas appliances were interviewed within 48 hours by a salesman.

The "pulling power" of the letter in connection with the broadside is indicated by the returns from one district where, by arrangement, the letter was omitted and display type was substituted on that particular page. The inquiries from this district were six-tenths of one per cent as compared with a uniform 2.2 to 3.4 per cent from the other districts.

From the sales angle the two inside pages of the broadside were devoted to the many advantages of modern gas ranges featuring the three ranges handled by the company's merchandise department. "Copy" for this part of the broadside consisted largely of epigrams built around pictures of four kitchens "with color". "No Delay Because of a Cold Stove—With a Modern Gas Range", "You Get More Heat Per Dollar—With Gas", "When You Use Gas —Your Supply Never Ceases", "Cooking is Speedier", "Your Bills are Lower" "If a Pan 'Boils Over' You Do Not Need a Repair Man", "Her Modern Gas Range Helps Keep Her Temper Sweet", "Works for You While You Rest"—referring to the automatic oven heat-control.

A special offer of $1.15 "down payment" was quoted as an aid in keying the returns. Newspaper advertising and colorful windows and counter cards for the sales rooms were used to support the direct mail effort. While the experiment is far from concluded it is evident that the sales returns will be as satisfactory to the company as the re-

(Continued on Page 50)

Free from cooking worries—
and yet —
her family is well fed!

WHETHER with, or without a maid, the domestic operation of any home runs smoothly with a modern gas range in the kitchen. Home cooked meals—nourishing roasts, appetizing vegetables, delicious desserts,—prepared as only SHE can prepare them.

Meals that the entire family ENJOY. Meals prepared happily, because they are prepared easily. Meals served joyfully and eaten with pleasure. Meals that really NOURISH. Thus, the modern woman—doing her work easily and scientifically with natural gas—sees to it that her family gets the food it needs for joyous and healthful living.

With the modern automatic oven heat control on her new gas range, the modern woman has time for other interests. Practically all of every afternoon and much of each forenoon now free from kitchen worries.

MODERN GAS APPLIANCES
Sold by our Company—
—For Cooking
—For Water Heating
—For Refrigerating
—For Home Heating
ARE DEPENDABLE

We are BACK of every appliance that we sell

YOU SAVE Money Work Worry WITH GAS

An entire dinner put on to cook—with the modern oven heat control properly set—
nothing more to do until time to serve the meal.

COOK WITH GAS
MODERN
CONVENIENT
DEPENDABLE
ECONOMICAL
CLEAN

NATURAL GAS — IN THE HOME — THE CONVENIENCE SUPREME

Some of the "copy" which made the direct-by-mail test successful.

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary

A. G. A. Pacific Coast Conference, February 6-7

AS announced in the December issue of *Western Gas,* plans are in preparation for the holding of a Pacific Coast Conference, February 6 and 7, of the American Gas Association Advisory Council and Executive Board. The Conference will meet in Los Angeles, at the Hotel Biltmore. President Oscar H. Fogg of the American Gas Association has requested F. S. Wade, president of the Southern Counties Gas Company to act as chairman of the committee on program and arrangements, and Mr. Wade has appointed a local arrangements committee headed by N. R. McKee, purchasing agent of the Southern Counties Gas Company.

Delegates to the Conference from the East and Middle West will number several score, and the visitors will be welcomed by many executives from among the companies included in the scope of the Pacific Coast Gas Association, at whose invitation the Conference has been placed this year on the Coast. The last occasion when the A. G. A. heads held such a gathering in the West was in 1925. The Eastern and Middle Western contingent is due to arrive in Los Angeles at 2 p.m., February 5, via Santa Fe.

While it is too early to regard the following program details as final, they will in the main constitute the outline of proceedings at the Los Angeles sessions February 6 and 7:

TENTATIVE PROGRAM FOR PACIFIC COAST CONFERENCE

Wednesday, February 6, 1929—10:00 A. M.
(O. H. Fogg, Presiding)

Call to Order

Welcome to Pacific Coast—C. H. Dickey, President, Pacific Coast Gas Association

Welcome to Los Angeles—F. S. Wade, Chairman, Committee on Program and Arrangements

Response and Opening Remarks—O. H. Fogg, President, American Gas Association

Nation-Wide Survey—Present Conditions and Future Possibilities

(a) Pacific Northwest—Guy W. Talbot, President, Portland Gas & Coke Company

(b) Pacific Southwest—A. F. Hockenbeamer, President, Pacific Gas & Electric Company

(c) Middle West—Samuel Insull, Jr., Vice-President, Midland Utilities Company

(d) South—Henry C. Morris, Vice-President, Dallas Gas Company

(e) Atlantic Seaboard—H. S. Schutt, General Manager, C. H. Geist Company

(f) New England—F. C. Freeman, Vice-President, Providence Gas Company

(g) Canada—Arthur Hewitt, General Manager, Consumers Gas Company of Toronto

Are Sales Conditions Different?—Clyde H. Potter, Chief Commercial Agent, Southern Counties Gas Company, Chairman, P. C. G. A. Commercial Section

Discussion

(Lunch—12 to 1:30)

Wednesday, February 6, 1929—1:30 P. M.

Agencies of Progress—Alexander Forward, Managing Director, American Gas Association

Dealer Cooperative Relations on Pacific Coast—R. E. Fisher, Vice-President, Public Relations and Sales, Pacific Gas & Electric Company

Discussion

The New England Plan of Cooperative Advertising—E. H. Bauer, Manager, Worcester Gas Light Company

The Cooperative Advertising Plan of the Pacific Coast Gas Association—C. B. Babcock, President, C. B. Babcock Company

Discussion

Research Program of the Gas Industry—H. C. Abell, Vice-President, Electric Bond & Share Company

Adjournment at 4:00 P. M. followed by Board Meeting

Thursday, February 7, 1929—10:00 A. M.
(C. H. Dickey, Presiding)

The Pacific Coast, Its Influence and Importance—LeRoy M. Edwards, General Counsel, Coast Counties Gas Company

Conservation of Natural Gas—A. F. Bridge, Vice-President of Operations, Southern Counties Gas Company

Utilization of Refinery Gas—W. S. Yard, Vice-President Gas Operations, Pacific Gas and Electric Company

Storage and Measurement of Large Volumes—S. W. Meals, President, Carnegie Natural Gas Company; Chairman, Natural Gas Department, A. G. A.

Manufactured Gas Technical Developments—C. J. Ramsburg, Vice-President, The Koppers Company

Discussion—E. L. Hall, General Superintendent, Portland Gas & Coke Company

Discussion—H. L. Masser, Vice-President and Executive Engineer, Los Angeles Gas & Electric Corp.

Closing Remarks—B. J. Mullaney, Vice-President, The Peoples Gas Light & Coke Company; Vice-President, American Gas Association

Association Calendar

Commercial Section Meeting, in connection with Western Metals Congress—January 17, Los Angeles, Calif.

Pacific Coast Conference, A. G. A. Advisory Council and Executive Board—Los Angeles, February 6-7.

Commercial Section, Northwest Meeting—Tacoma, Washington, Feb. 1.

Annual Convention — Del Monte, week of September 11, 1929.

Appliance Manufacturers' Directory

THE Commercial Section, under the direction of Clyde H. Potter, is now working on a revision of the Directory of Gas Appliance Manufacturers operating on the Pacific Coast, first published by the Association in 1926.

Every effort is being made to make the Directory complete by including in it all gas appliance manufacturers doing any volume of business in the Pacific Coast states. The most difficult feature of securing this accuracy is the discovery of new manufacturers, many of whom are not affiliated with the Association and are not known outside of their local territory.

All members of the Commercial Section Executive Committee have been supplied with copies of the 1926 issue of the Directory and requested to furnish the Secretary with the names of manufacturers in their territory not previously listed.

The Directory will be issued just as soon as Mr. Potter can be reasonably assured that the information obtained is complete.

Natural Gas Committee Set-up Announced

WILLIAM MOELLER, Jr., Southern California Gas Company, chairman of the Technical Section's Natural Gas Committee announces the set-up for his committee's 1929 work as follows: Under the three general divisions of natural gas measurements, natural gas transmission pipe line, and natural gas compressor stations the work on natural gas has been organized for the year.

Wm. Moeller, Jr.

Assisting Mr. Moeller on the general committee are H. P. George, Southern California Gas Company, and A. F. Bridge, Southern Counties Gas Company.

The natural gas transmission pipe line committee, which will have as its duty the development of a symposium on natural gas pipe line practice, is made up of F. F. Doyle, Southern California Gas Company, Los Angeles, chairman; B. Laulhere, Southern California Gas Company, Los Angeles; Carl Summers, Southern Counties Gas Company, Ventura; F. E. Jinnett, Ventura Fuel Company, Ventura; R. L. Cook, Southern California Gas Company, Los Angeles; H. Graham, Southern California Gas Company, Taft.

The natural gas compressor station committee will carry on a similar activity, preparing a symposium on natural gas compressor station practice. E. Henderson, Southern California Gas Company, Los Angeles, is chairman of the committee. Other members are A. B. Newby, Southern California Gas Company, Taft; T. C. Wallace, Southern Counties Gas Company, Ventura; Charles Pool, Ventura Fuel Company, Ventura; R. H. Haun, Southern California Gas Company, Ventura; S. S. Donaldson, Southern California Gas Company, Los Angeles.

F. A. Hough, Southern Counties Gas Company, chairman of the natural gas measurements committee, summarizes his committee's projects in a statement published elsewhere in this department.

P.C.G.A. Industrial Men in Metals Congress Meeting

DURING the dates January 14, 15, 16, 17 and 18 the Western Metals Congress is holding session in Los Angeles, its headquarters being at the Shrine Civic Auditorium and the Biltmore Hotel. General support is being accorded W. H. Eisenman, secretary of the American Society for Steel Treating, the organization under whose auspices the event is being conducted, some 14 organizations being identified with the Congress program. A metal and machinery exposition of considerable proportions is a feature of the Metals Congress.

The morning session of January 17, opening at 10 o'clock at the Biltmore, is in charge of the Pacific Coast Gas Association Commercial Section, and the following program has been prepared by C. M. Grow of the Southern California Gas Company on behalf of the P.C.G.A. working with representatives of the Congress:

Thursday, January 17th, 10 O'clock A.M.

(1). "Gas Versus Electricity," a presentation by F. W. Manker of the Surface Combustion Company of Toledo, Ohio.
(2). "Heat Treating Furnace Design," by J. H. Gumz of the Pacific Gas and Electric Company, San Francisco, California.
(3). "Existing Heat Treating Installations," by E. M. DeRemer, Southern California Gas Company, Los Angeles, California.
(4). "What the Gas Companies Are Doing to Help the Steel Treater," by C. M. Grow, Southern California Gas Company, Los Angeles, California.
(5). "Gas as Applied to Carburizing," by Professor Robert Guthrie, Metallurgist, Peoples' Gas and Coke Company, Chicago, Illinois.

Distribution Work Gets Under Way

ORGANIZATION of the Distribution Committee, Technical Section, Pacific Coast Gas Association, has been effected, reports W. M. Henderson, its chairman. An advisory committee was first appointed consisting of the following:

Robert Carver, British Columbia Electric Power & Gas Co., Vancouver, B. C.
Lee Holtz, Southern California Gas Co., Los Angeles.
W. H. McLean, Pacific Gas and Electric Co., San Jose, Calif.
W. F. Pape, Pacific Gas and Electric Co., Oakland, Calif.
D. E. Widdersheim, Pacific Gas and Electric Co., Stockton, Calif.
E. T. Floyd, Pacific Gas and Electric Co., San Francisco.
D. B. Larson, Portland Gas & Coke Co., Portland, Ore.
D. H. Perkins, San Diego Consolidated Gas and Electric Co., San Diego, Calif.

W. M. Henderson

W. F. Tyler, San Joaquin Light & Power Co., Bakersfield, Calif.
J. J. Ferrari, Puget Sound Power and Light Co., Bellingham, Wash.
C. H. Weber, Tucson Gas, Electric Light & Power Co., Tucson, Ariz.
E. A. Angeley, tah Gas & Coke Co., Salt Lake City, Utah.
Geo. Wehrle, Public Service Co. of Colorado, Denver, Colo.
Jos. T. Sullivan, Sierra Pacific Power Co., Reno, Nev.

At a meeting of this committee a program of activities for the coming year was adopted. Such subjects as were considered of interest to distribution men and of value to the industry were given consideration, and the Distribution Committee decided upon the following outline with the subject and chairman as indicated:

Unaccounted-for Gas
L. L. Biggs, Chairman, Southern California Gas Co., Los Angeles.

Corrosion
Dozier Finley, Chairman, Paraffine Companies, Inc., Emeryville, Calif.

Gas Meters
R. M. Stewart, Chairman, Pacific Gas and Electric Co., San Francisco.

Regulator and Governor Capacities
R. R. Hargreaves, Chairman, Pacific Gas and Electric Co., San Jose.

Customers Service
A. R. Bailey, Chairman, Los Angeles Gas and Electric Corp., Los Angeles.

Load Factors
W. F. Pape, Chairman, Pacific Gas and Electric Co., Oakland.

Standard Units and Ratios for Distribution
E. G. Campbell, Chairman, Pacific Gas and Electric Co., San Francisco.

Materials and Methods
William Barr, Chairman, Pacific Gas and Electric Co., Sacramento, Calif.

The chairman of each committee has solicited membership on his committee from the various individuals, and work is well under way in the gathering and preparation of data for the report to be finally submitted at the convention in September, 1929.

Commercial Section Heads to Meet January 18

CLYDE H. POTTER, general chairman of the Commercial Section, has called a meeting of the Section's executive committee to be held at 2 o'clock in the afternoon of Friday, January 18 in Room 926 of the Los Angeles Gas and Electric Corporation Building, Los Angeles.

'29 Work of Committee on Natural Gas Measurements

THE Natural Gas Measurements Committee for this year has been divided into two sub-committees, each of which is working independently on gas measurement problems. One subcommittee is making a study of problems which arise in the measurement of gas through learge capacity displacement meters. This committee hopes eventually to make a report on this type of meter which will bring together under one cover all of the tables needed by users of this type of meter, as well as authoritative information concerning such questions as the following:

1. How does the capacity of displacement meters vary with the static pressure?
2. What are the factors that limit the capacity of a displacement meter?

(Continued on Page 33)

EDITORIAL

The 1929 Tempo

"ESSENTIALLY a year of commercial activity." In these words one Western gas company executive sums up his company's attitude toward the twelve-month period now beginning. His case is only one among many, for sales plans are given prominent place in the 1929 program of a majority of Western gas companies. In many ways 1928 ushered in a period of sales activity in the West, which will carry on to a marked degree this year.

Western Gas has in this issue compiled more than a score of brief statements concerning the year ahead, from leaders in the gas industry. While these statements are merely individual opinions on what the year's tempo is to be, their composite should form a true direction sign for 1929. This composite picture is a thoroughly encouraging one, for practically without exception the statements foretell increases in gas sales on the local systems represented. We recommend that these statements be read and digested. The most productive psychology for an industry is that of intelligent optimism, and a reading of these expressions from outstanding executives—who, more than others, set the industry's pace—will convince the most pessimistic that there are grounds for optimism in the outlook for 1929.

A Business Engineer at the Helm

UTILITY operators, in common with other business elements which make up our national fabric, should feel a large measure of satisfaction in the elevation of Herbert Hoover to the United States presidency. Hoover stands as a type, albeit a rare one. Coming from a background of private engineering enterprise, he has brought into his administration of public office the keen powers of economic analysis which served him well in private life. His sound views on fundamental relationships which should exist between government and business are well known, and justify the belief that if his wishes have force, private initiative in industry will be left free to work out its own salvation along economic lines. Industry may look to intelligent representation of its interests with Hoover at the national helm.

Another Southwest Division Conference

FOR the second time the Southwest Division of the American Gas Association's Natural Gas Department is calling its members into annual session, this year for a two-day meeting at Shreveport, Louisiana, January 14-15. Gas men of Oklahoma, Texas, Arkansas and Louisiana have planned enthusiastically for this conference, and the program outlined elsewhere in this issue should be of much value.

There was wisdom behind the creation of the Southwest Division, for within its territory is concentrated the bulk of the nation's natural gas production. The Division can fill a worthwhile place as a medium for exchange of the new knowledge developed in bringing these tremendous gas supplies to their potential markets. The science of long distance gas transmission is a young one, and to it the Southwest Division can contribute valuable chapters by drawing upon the talents of its members. Other problems particularly applicable to this Southwest section, such as that of devising economical distribution systems for small communities, will receive expert consideration at Shreveport, as will the many aspects of gas sales activity.

Holding the Domestic Load Through Service

HOLDING the domestic load in many cases simply resolves itself into extending service along practical lines calculated to bring lasting satisfaction in the use of gas. An unusual piece of gas company service to consumers, which is having the effect of "holding the load" comes to hand in the case of the Turlock Gas Company, serving the town of Turlock, California. In its small community this utility has adopted a policy of following its appliances into the homes of its consumers and seeing that they give more than the usual degree of satisfaction. To insure that the consumer will get his money's worth and more, not alone in operating efficiency but in the appearance value of his stove or cabinet type heater, the company has for some time been painting vent pipes, collars, etc., to match the appliances installed.

Following the appliance into the home pays in this case, for this utility in a community of about 4,000 population has 950 consumers and holds them in the face of intense municipal electric competition.

Natural Gas Measurements

(*Continued from Page 31*)

3. Under what service conditions does a displacement meter give more accurate measurement than an orifice meter, and vice versa?

4. When conditions are such that either meter will give accurate results, what are the economic factors that govern the type of meter that should be used?

5. What are the comparative merits of the various methods now available for testing large capacity displacement meters?

6. What are the precautions to be observed when using these test methods?

7. With what frequency must large capacity displacement meters be tested and repaired to insure accurate measurement?

Members of the committee are now corresponding with meter engineers of the various companies that manufacture large capacity displacement meters, in an effort to obtain as much of the desired information from them as is possible. Later, if necessary, the committee will undertake tests to obtain information not otherwise available.

The committee's chance of turning out a report that will be accepted as authoritative is consderably enhanced by the fact that H. S. Bean, chief of the Gas Measurements Section of the Bureau of Standards, who is working in Southern California this winter, has agreed to assist the committee in this work.

The other sub-committee will devote itself to orifice meters. It is probable that this committee will cooperate with Mr. Bean, who is planning to conduct tests designed to check orifice meter coefficients for very high pressures and for very high rates of flow. This work is being done by Mr. Bean in connection with the work of the Gas Measurements Committee of the American Gas Association, with which committee the Bureau of Standards is cooperating. If the plans of that committee for conducting tests on the Pacific Coast are carried out, our committee will consider it a privilege to cooperate in the work.

The membership of the Pacific Coast Gas Association's Gas Measurements Committee for 1929, is as follows:

F. A. Hough, Southern Counties Gas Company, Chairman.
G. M. Reece, Southern Counties Gas Company.
Edgar Wilde, Southern Counties Gas Company.
Albert E. Madden, Southern Counties Gas Company.
Fred Winslow, Southern Counties Gas Company.
B. M. Laulhere, Southern California Gas Company.
R. L. Cook, Southern California Gas Company.
E. Lorenz, Southern California Gas Company.
M. Levering, Southern California Gas Company.
M. J. Cereghino, Los Angeles Gas and Electric Corporation.
L. P. W. DeBrisay, Los Angeles Gas and Electric Corporation.

Production Committee Membership

DUE to space limitations in the Association department of last month's issue it was impossible to present the line up of committees through which will be conducted the activities of the Technical Section's Production Committee, of which J. E. Kelley, Pacific Gas and Electric Company, is chairman. The Production Committee organization is as follows:

GENERAL PRODUCTION COMMITTEE

J. E. Kelley, Chairman, Pacific Gas and Electric Co.
W. A. Bahr, Pacific Gas and Electric Co.
C. M. Cole, Southern California Gas Co.
O. L. Dickinson, Pacific Gas and Electric Co.
W. H. Dreaper, British Columbia Electric Power & Gas Co.
J. J. Ferarri, Puget Sound Power & Light Co.
L. A Fulton, Pacific Gas and Electric Co.
A. E. Englebright, Pacific Gas and Electric Co.
A. E. Hall, Coast Counties Gas & Electric Co.
J. A. Harritt, San Diego Consolidated Consolidated Gas & Electric Co
R. H. Hargreaves, Pacific Gas and Electric Co.
F. C. Hawks, Washington Gas & Elecrtic Co.
L. B. Jones, San Francisco.
J. T. Leary, Pacific Gas and Electric Co
T N. Kellett, Los Angeles Gas & Electric Corp.

J. E. Kelley

D. J. McCarthy, Pacific Gas and Electric Co.
Roy T. Richards, Central Arizona Light & Power Co.
J. A. Riggs, Modesto Gas Co.
R. R. Ripley, Portland Gas & Coke Co.
Ted Rosebaugh, Pacific Gas and Electric Co.
J. F. Sauer, Pacific Gas and Electric Co.
R. F. Smith, Arizona Edison Co.
J. T. Sullivan, Sierra Pacific Power Co.
Frank Wills, Pacific Gas and Electric Co.

SUB-COMMITTEES

Oil Gas Generator Operation

R. R. Ripley, Chairman, Portland Gas & Coke Co.
W. A. Bahr, Pacific Gas and Electric Co.
M. J. Cereghino, Los Angeles Gas & Electric Corp.
A. F. Derrick, Pacific Gas and Electric Co.
A. E. Englebright, Pacific Gas and Electric Co.
A. E. Hall, Coast Counties Gas & Electric Co.
J. A. Harritt, San Diego Consolidated Gas & Electric Co.
T. N. Kellett, Los Angeles Gas & Electric Corp.
J. T. Leary, Pacific Gas and Electric Co.
Roy T. Richards, Central Arizona Light & Power Co.
J. A. Riggs, Modesto Gas Co.
A. M. Reisen, Pacific Gas and Electric Co.
R. F. Smith, Arizona Edison Co.
J. T. Sullivan, Sierra Pacific Power Co.

Water Gas Manufacture

J. J. Ferrari, Chairman, Puget Sound Power & Light Co.
W. H. Dreaper, British Columbia Electric Power & Gas Co.
F. C. Hawks, Washington Gas & Electric Co.
R. A. Hoffman, Spokane Gas & Fuel Co.
J. F. Sauer, Pacific Gas and Electric Co.
J. T. Sullivan, Sierra Pacific Power Co.
H. M. Thomas, Pacific Power & Light Co.

Scrubbing and Purification

Ted Rosebaugh, Chairman, Pacific Gas and Electric Co.
F. M. Cota, San Diego Consolidated Gas & Electric Co.
J. E. Currens, Pacific Gas and Electric Co., Stockton.
A. E. Englebright, Pacific Gas and Electric Co.
R. H. Hargreaves, Pacific Gas and Electric Co.
N. H. Wardale, Portland Gas & Coke Co.

Gas Oil Specifications

F. C. Jones, Chairman, Pacific Gas and Electric Co.
F. M. Cota, San Diego Consolidated Gas & Electric Co.
Guy Corfield, Los Angeles Gas & Electric Corp.
V. H. Halstead, San Diego Consolidated Gas & Electric Co.
S. C. Schwarz, Portland Gas & Coke Co.
Duncan Stewart, Pacific Gas and Electric Co.

Chemical Analytical Methods

Duncan Stewart, Chairman, Pacific Gas and Electric Co.
K. N. Cundall, Pacific Gas and Electric Co.
Malcolm T. Burton, Southern California Gas Co.
W. S. Hyde, Pacific Gas and Electric Co.
J. M. North, Los Angeles Gas & Electric Corp.
M. A. Richford, Pacific Gas and Electric Co.
S. C. Schwarz, Portland Gas & Coke Co.
C. E. White, San Diego Consolidated Gas & Electric Co.

Refractories

T. N. Kellett, Chairman, Los Angeles Gas & Electric Corp.
W. A. Bahr, Pacific Gas and Electric Co.
I. J. Breslin, Pacific Gas and Electric Co.
M. J. Cereghino, Los Angeles Gas & Electric Corp.
Walter Cohick, Pacific Gas and Electric Co.
A. F. Derrick, Pacific Gas and Electric Co.
O. L. Dickinson, Pacific Gas and Electric Co.
V. R. Hughes, Pacific Gas and Electric Co.
D. J. McCarthy, Pacific Gas and Electric Co.
W. R. McDonald, Pacific Gas and Electric Co.
A. M. Reisen, Pacific Gas and Electric Co.
W. E. Richmond, San Diego Consolidated Gas & Electric Co.
J. A. Riggs, Modesto Gas Co.
H. J. Smith, Pacific Gas and Electric Co.
T. W. Snell, Pacific Gas and Electric Co.
J. T. Sullivan, Sierra Pacific Power Co.

Oil Mixing and Sprays

R. H. Hargreaves, Chairman, Pacific Gas and Electric Co.
A. F. Derrick, Pacific Gas and Electric Co.
D. J. McCarthy, Pacific Gas and Electric Co.
A. M. Reisen, Pacific Gas and Electric Co.

Organic Sulphur

K. N. Cundall, Chairman, Pacific Gas and Electric Co.
H. M. Barnes, San Diego Consolidated Gas & Electric Co.
F. R. de Ong, San Francisco, Calif.
L. B. Jones, San Francisco, Calif.
S. C. Schwarz, Portland Gas & Coke Co.
E. L. Theobald, Pacific Gas and Electric Co.

Symposium Gas Plant Operation

D. J. McCarthy, Chairman, Pacific Gas and Electric Co.
W. A. Bahr, Pacific Gas and Electric Co.
M. J. Cereghino, Los Angeles Gas & Electric Corp
R. A. Chambers, San Diego Consolidated Gas & Electric Co.
C. M. Cole, Southern California Gas Co.
C. T. Crouch, Pacific Gas and Electric Co.
A. E. Hall, Coast Counties Gas & Electric Co.
T. N. Kellett, Los Angeles Gas & Electric Corp.
J. T. Leary, Pacific Gas and Electric Co.
O. A. Philpott, Pacific Gas and Electric Co.
Roy T. Richards, Central Arizona Light & Power Co.
J. A. Riggs, Modesto Gas Co.
R. R. Ripley, Portland Gas & Coke Co.
R. F. Smith, Arizona Edison Co.

Proceedings Soon Ready

THE work done by the Pacific Coast Gas Association during 1928 as recorded in papers, reports and Convention discussions, has been compiled and edited and is now in the hands of the printer.

The resulting volume will be known as Volume 19 of the Proceedings and should be in the hands of members of the Association within a few weeks. As was done last year, copies of this volume will be sent only to Association members whose dues for the current year have been paid.

Northwest Commercial Men Meet Feb. 1 at Tacoma

J. EARLE JONES, vice-chairman of the Commercial Section for the Northwest, announces that a Commercial Section Northwestern meeting will be held in Tacoma, Washington, the afternoon and evening of January 1, and those present will be guests of the Washington Gas and Electric Corporation.

With *the* Metermen

Paper Making *as* Applied *to* Gas Measurement

By S. R. COLEMAN
*Kellow & Brown**

ESSENTIAL to the proper recording of measurement in a gas or gasoline plant is the use of the orifice meter in which the measurements are recorded on a rotating chart.

Each gasoline plant will have 10 or more plant meters, as many as 100 meters measuring gas from wells, and several fuel return meters, each with its story inscribed upon a chart.

The entire operation of the gasoline plant, as well as an equitable distribution of its profits, is dependent upon correct measurement. Each utility company has hundreds of orifice meters buying and selling gas. Each refinery moves a part of its products to desired locations, in amounts as given by orifice meters, and its entire operation is influenced by such measurement. Throughout the entire gas and gasoline industry the orifice meter chart bears a heavy burden. It should then be instructive and of interest to consider the making of the present day chart to obtain the dependable and accurate reading which is so necessary to the industry.

Orifice meter charts should be made of a paper stock chosen with definite regard to the use to which it is to be subjected. Improper paper often results in the chart stretching or contracting one way, making an eccentric and therefore an inaccurate record.

A brief discussion of paper making is therefore important because of its influence on final results.

It is altogether desirable that the paper user should have a general knowledge of the process, because with such knowledge at his command his judgment and discrimination may be depended upon to distinguish real merit in the paper he chooses for his purpose.

RAGS STILL FAVORED

In the minds of most people the raw material usually associated with making paper is rags, and while the use of wood pulp has greatly changed conditions in the last 25 years for cheaper papers, rags today are about as important to the paper mills making higher grades as they were a century ago.

THE THRASHER

The rags are received at the mill in compressed bales, and the first operation is feeding them to the thrasher, a cylindrical machine with a rapidly rotating shaft containing a number of steel arms running through its center, and equipped with a heavy wooden or steel beam at the top and a wire mesh screen at the bottom. As a charge is fed into this machine it is picked up by the arms, and the rags are whipped against the beam with great violence. The heavy dust falls through the screen at the bottom, and the lighter dust is drawn away through exhaust pipes at the top. After a few minutes of this great pounding and whipping, the rags are discharged onto a moving apron which takes them to the sorting room for hand sorting. This operation of hand sorting is performed by women, who stand before tables covered with wire screens through which the dust sifts, to be drawn away by exhaust fans. Fastened to each table is a long scythe blade with the edge away from the operator; with this she opens the seams and cuts off buttons, rubber (a great curse to the paper maker as it does not bleach and clogs the strainers), hooks and eyes, and other foreign substances.

*Delivered before the Southern California Meter Association, November 22, 1928, at Long Beach, California.

CUTTERS

Subsequently the rags undergo a second inspection, and are then sent to the cutters, which very rapidly chop them into small pieces, after which they are further purified in a series of fan dusters or hollow drums covered with wire cloth, against which the rags are tumbled with great violence by means of an arm running through the center. At this point the rags are ready for boiling, for after this vigorous treatment they are clean and free of dirt—but this condition has been reached at the expense of much loss in weight.

The rags are now packed in a large horizontal boiler called a "rotary." This is provided with manholes for furnishing the rags and is mounted on hollow trunnions for the admission of steam. To clean the rags from all fatty and other impurities and all colors and dyes a solution of lime is used and the rags cooked and slowly rotated under pressure for several hours. When the boiling is finished the steam and liquor are blown off and the rags are dumped from the slowly revolving rotary. The rags are now of a uniform brown color, and the grease, dyes and other impurities have combined with the lime to form insoluble compounds, which can be readily washed away.

They are now ready for the next process—the washer. This is called a "Hollander," from the fact that these rag engines were invented in Holland about 1750. The rags are now put into the washing engine, and an abundant stream of pure filtered water is introduced continuously, the roll being raised so that the rags pass around freely without being beaten into pulp, as otherwise the dirt would be ground into the fibres. The dirty water is removed by the drum washer.

At this point a solution of bleaching powder is added to the pulp and in an hour the mass is as white as milk.

DRAINERS

The valves of the washing engine are now opened and the contents let down through large copper pipes into the drainers. These are large concrete vaults provided with perforated tile floors. Here the pulp is allowed to drain until all water has been removed, and here we will let it rest for a

Southern Calif. Meter Assn. Meeting *of* December 27

A MEETING of decided importance in the series of monthly meetings held by the Southern California Meter Association was that of December 27, attended by 69 members and visitors. H. S. Bean of the United States Bureau of Standards brought to the meeting an illuminating discussion of "The Effect of Various Pipe Fittings on Orifice Meter Indications." Mr. Bean is at present on the Coast furthering his experimental work with the Bureau of Standards, and members of the Association will follow with interest his program of checking orifice meter coefficients for very high pressures and high rates of flow. These experiments are being conducted by Mr. Bean in connection with work of the gas measurement committee of the American Gas Association.

Prior to Mr. Bean's discussion at the December 27 meeting a highly interesting paper was read by L. Bonner of the Standard Gasoline Company on "The Effect of Low Rates of Flow Through Orifice Meter Installations."

Announcement of the Association's Hi-Jinks dates was made, the Rio Hondo Golf Club near Downey being the scene of this annual social event, January 25. Tickets are priced at $3.00 and are being distributed by President B. M. Laulhere, Carl W. Brockman, and Malcolm R. Miller, chairman of the entertainment committee.

The Annual Proceedings of the Southern California Meter Association for 1927-1928 are now off the press and copies were shown at the December 27 meeting, each member of record on June 28, 1928, being entitled to a copy, the cost covered by his 1927-1928 dues. Copies are available to others from the Associtaion's secretary, A. G. Lindell, Box 322, Anaheim, California.

On January 12 there will be conducted the next monthly industrial tour for Association members, through the plants of the Pacific Pipe and Supply Company, Robinson Orifice Fitting Company, and Neilan Schumacher & Company, all in Los Angeles. Carl W. Brockman, who arranged this tour, explained that one hour would be spent at each of these plants, beginning at two o'clock, Saturday afternoon, January 12.

time while we turn our attention to the preparation of certain other fibres that enter into the manufacture of papers.

PREPARING WOOD PULP

The preparation of any raw material for use as paper consists essentially in isolating the cellulose in the form of fibres from the intercellular matter with which it is surrounded. The bark is removed when the tree is cut. It is stored in the mill yard until thoroughly dried, and the first operation is to feed the logs to the chipper.

This machine consists of a very heavy steel disc eight feet in diameter, set with three radial knives and provided with a trough for the purpose of holding the log in such a position that the chips are cut off with a slicing motion by the rapidly-revolving knives.

The wood having been chipped is fed to the digesters—upright cylindrical boilers seven feet in diameter and 25 feet high, welded electrically into one piece. A charge of wood is put into the digesters with a suitable amount of caustic soda. The openings are closed and steam is admitted, full pressure is reached as soon as possible and maintained for several hours, after which the contents of the digester are blown into one of a series of washing tanks with perforated false bottoms, where the cooking liquor is allowed to drain off and the pulp is subjected to a thorough washing. When the pulp first leaves the digester it is a dark, rich brown color; after washing it is a light grayish brown and is ready for screening.

At this point the pulp is diluted with a large amount of water to enable it to pass through the screens. These screens consist of long wooden cradles having bottoms of brass plates with a large number of V slots, only a few thousandths of an inch wide, in them. A continuous but light suction is maintained beneath the plates by diaphragms, which causes the fine pulp to flow through the slots while the coarse chips and dirt are retained on top of the plates and removed at intervals.

The pulp is now ready for bleaching, but in order to remove the excess of water as well as any trace of the spent cooking liquor that may remain, it is first put through the wet machine.

As the film of pulp reaches the extreme top of the revolution, it is removed by a couch roll. This is a roll covered with some yielding substance like woolen felting or rubber; it rests on the cylinder, and as the film of pulp passes under it with a gentle pressure it squeezes still more water out of the pulp and lifts it off the face of the wire cloth. The pulp now passes on an endless web of woolen felt to press rolls which deprive it of still more water and it is then delivered to the bleachers.

The tub of the bleacher is filled with wood pulp from the wet machine, a sufficient amount of pure filtered water is added together with chloride of lime in solution, and the contents circulated and mixed for a space of four to six hours. No shortening or beating of the fibres takes place in this process, the entire preparation having been accomplished in the digester.

BEATING ENGINES

The two general operations in the production of the raw materials, rags and wood pulp, which we have previously described, are combined beyond this point, when both rag half-stuff and soda pulp are brought from the drainers into the beating engines.

One of the most important operations in the manufacture of first-class paper is that of beating, by which the half-stuff becomes reduced to a finer state of division and the fibres are put into such condition that they will interweave with each other of felt on the moving wire of the paper machine. The beating engine, or beater, much resembles a washer, but since its function is to still further reduce the fibres, the knives are more numerous and are made to revolve more rapidly. The rag half-stuff and soda wood pulp are here added in the proper proportions, as well as sulphite. Sulphite pulp is added to give the paper strength and color. This is made from coniferous wood grown in Northern United States, Canada, and in Scandinavia. The fibre is isolated by boiling in bisulphite of calcium and magnesium.

The sizing is also added at this point to fill the pores and improve the printing surface, and sizing to prevent the absorption of printer's ink.

It is possible to complete the preparation of the fibres in the beating engine, as was usually the custom in the 'Eighties or earlier, but in modern practice the pulp is pumped through a refining engine into a stuff chest (a large semi-circular concrete tank with horizontal agitator to keep the pulp from settling), from which it is further pumped to the paper making machine.

THE PAPER MAKING MACHINE

The paper making machine consists of the following parts: the screens; the wire, with dandy roll, deckel straps and suction boxes; the couch rolls; the first press; the second press; the third press; the driers; the calenders; the reel; and the slitter.

From the stuff chest the pulp, which is now diluted with a large amount of water, flows through sand settlers and regulating gates to the screens, which are similar in construction to those previously described.

The strained and purified pulp flows over an apron onto an endless traveling wire cloth, the mesh of which is 60 to 90 threads to an inch. The wire is supported perfectly level on a great many small rollers under which is a shallow wooden box, the "save all," into which much of the water runs, leaving the pulp on the wire. The water in the "save all" contains some fibre and is used over and over again.

The edge of the flow of pulp at the sides is made by endless rubber deckel straps, which travel with the wire. These are adjustable so that varying widths of paper may be made. The frame supporting the wire receives a lateral shaking motion, which, coupled with the forward motion, results in the felting of the fibres into a strong sheet.

The forward motion of the wire tends to arrange the fibres in the same direction, and the side shake is necessary to offset this tendency, giving strength in both directions. The water drains rapidly away from the pulp, the drainage being assisted by two or three "suction boxes" under the wire, which are connected with a pump and exhaust the water much faster than would otherwise be possible. At this point, between the suction boxes, is situated the "dandy roll," a light cylinder covered with a wire, which rests on the upper surface of the moist paper, giving it the impression of whatever design is on its surface. "Wove" paper has both sides impressed with the fine woven wire; that is, the dandy roll is covered with the same wire as the paper is formed on. In "Laid" paper, on the other hand, the dandy is covered with parallel wires, with a cross wire at intervals. Watermarks are impressed in the paper by superimposed designs on the face of the dandy roll.

At the end of the wire (that is, where it turns down over a roll to return to the starting point), are the couch rolls, through which the wire passes bearing the web of paper. These rolls press the water out still more and consolidate the fibre, giving it strength to cross over the gap between the wire and the felt of the first press roll. These rolls correspond in function to the pressure applied to the "post" of the alternate sheets of damp paper and felts in hand-made paper.

An endless woolen blanket supports the tender web of paper through a pair of highly-polished brass and rubber rolls under considerable pressure, giving the upper side of the sheets a smooth surface and leaving the impress of the felt on the under side. From the first press the sheet runs under the second and third pair of rolls, and back through them in the reverse direction, thus smoothing the other side of the sheet and giving as even-sided results as possible.

The paper is now formed and it only remains to dry it. The driers are a series of steam heated cast iron cylinders, four feet in diameter, arranged in two tiers. The paper is carried nearly around each drier in turn, and onto the next, being held to the hot surfaces by an endless blanket, usually of cotton. The size and number of driers determine how fast a paper can be run. With a given machine, thin papers can be run (and dried) very fast; thick ones slowly.

After being thoroughly dried, the web of paper is passed through a "stack" of smooth, chilled iron rolls, which by their own weight and pressure, supplemented by screws or weights, smooth the paper and produce what is called "Machine Finish" as contrasted with "Super-calendered" paper. The calenders determine the various finishes of "M. F." paper. To produce a high finish, the paper is run through the entire "stack," while in running a rougher finish, such as an antique, a certain number of iron rolls are by-passed. It is now wound on the reel.

After being reeled, the paper is passed through the slitter, the rough outside edges trimmed, and the single web slit into any required widths. It is then ready for shipment (if intended for printing in the roll) or for coating; or for super-calendering, sheeting and packing.

Many grades of paper require a higher surface and smoother finish for finer printing and color work; this is given by the super-calendars, a stack or tier or heavy rolls driven by power applied to the bottom roll only. The web of paper passes between alternate rolls of chilled iron and compressed paper under heavy pressure, which, combined with the slip between the rolls, level and polish the surface and makes it smooth and uniform.

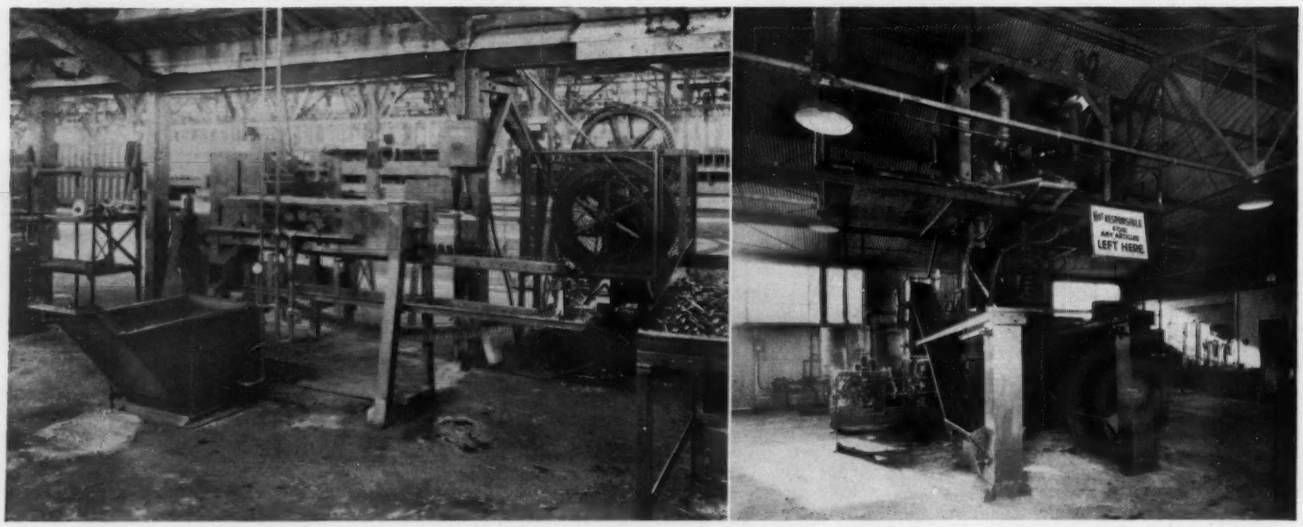
As a general rule, most papers are made on a cylinder paper making machine which lays the small fibres in a parallel formation, the way the fine mesh screens and blankets are travelling. This produces a paper highly satisfactory for most commercial purposes, but not suitable for charts.

PAPER FOR METER CHARTS

The Fourdrinier paper making machine gives the travelling screen a shaking, lateral motion, which offsets the tendency of the fibres to lay in parallel formation, but instead produces an interlacing of the fibres. Paper made with this formation is most suitable for meter charts.

The greatest enemy of meter charts is the influence of the atmosphere, as all paper is cellulose of various kinds, and cellulose is a material that absorbs or gives off moisture rapidly, according to the humidity of the atmosphere. The cellulose fibres swell or contract in diameter as they take on or give off moisture. Therefore, a sheet with the fibres in parallel formation will stretch

(*Continued on Page 40*)



LEFT: Continuous gas-fired heat treating furnace for hardening small forgings. RIGHT: Showing oil jacketed kettles (on elevated platform) heated by direct gas fire.

Requisites *in* Selling Gas *for* Industrial Uses

a new kiln would not be needed. A trial was arranged and after adjustments were made a production of over 10,000 pounds of dry material per 24 hours was secured. The boiler plant, of course, was shut down and it was found that the cost of gas was approximately $800.00 monthly. This cost meant that the drying cost per ton of finished product had in effect been cut in half with the use of gas.

In this instance a study showed that the use of gas under the boilers in place of fuel oil was out of the question. Likewise, the installation of new gas boilers and a new kiln or other costly equipment were also impossible. It only remained then to apply gas directly to the work to eliminate or lessen heat losses in every way possible. In effect the overall thermal efficiency was increased from 7 per cent with oil to about 50 per cent using gas. The entire change was made at a minimum cost which was but a fraction of what a new kiln would have cost, and a very desirable gas load was secured.

A daily newspaper in a certain city was sold and installed a standard burner for heating its 6,000-pound capacity stereotype pot. Coal had been used prior to the installation of gas. Average number of plates cast daily was about 60. The equipment included thermostatic control and the cost installed was about $475. The installation of the gas burner was completely satisfactory.

Several months after this installation a smaller daily newspaper in the same city was interested in the use of gas in place of coal under its stereotype pot. About 40 plates were cast daily from a pot of 5,000-pound capacity. An effort was made to sell equipment similar to the first newspaper but the cost proved an unsurmountable obstacle. A burner was improvised and installed at a cost of about $100. After a trial of several weeks it was removed and the use of coal resumed because the cost of gas was too high. In fact the gas usage was greater than that of the larger newspaper. It will now be a long time before this newspaper

(*Continued from Page 24*)

can again be induced to try gas. A mistake in judgment was made not to insist on the standard and proven burner equipment being used. This mistake was made in spite of the fact that five different newspapers had been sold and had installed the standard burners during a previous two years. Anxiety to secure the gas load was, of course, the cause for the mistake being made.

The foregoing illustrates that the use of stock equipment in this particular case was preferable to an improvised burner.

A certain manufacturer had a problem of hardening the ends of small forgings which were about five inches long. The practice was to place the end to be hardened in the opening of a forge furnace and when it had reached the desired temperature of about 1450° the workman removed it and dropped it in the water. Working steadily for eight hours a day it was possible for the workman to harden about 2,000 forgings per day. It was contemplated to increase the production of these forgings to about one million and a half and it was at once obvious that the labor cost on hardening and the time required by the procedure in use would be out of all proportion to the value of the forging. Plans were prepared of a continuous furnace in which these forgings could be heat treated automatically at the rate of about 1500 per hour. The furnace was built by the manufacturer and placed in operation and by actual count 1440 forgings an hour were run through the furnace. Fuel consumption on the furnace was practically the same as on the furnace previously used by the workman hardening 2000 per day.

In this particular case the gas company did not increase the gas usage of the manufacturer but the business was retained for gas. The time involved in designing and building a furnace by an eastern furnace manufacturer as well as the cost of this procedure would probably have been so great that the prospect would have installed crude oil burning furnace. As a matter of fact plans were being prepared for such a furnace at the time the gas sales engineer entered the picture and proposed the use of gas.

One more example to illustrate the ingenuity which must be necessary in order to secure gas business may be of interest. A fruit juice manufacturer desired to treat large quantities of grape juice prior to bottling for sale. The procedure called for heating grape juice to about 120° in steam-jacketed kettles. The rate at which the fruit juice was to be treated would have necessitated a steam boiler of at least 30 H. P. capacity operating at a pressure well over 100 pounds. The installation of such a boiler using gas would have presented an excellent opportunity for an oil burner salesman to install oil. It was decided that the operation could be carried on with a direct-fired unit. A furnace was therefore designed to surround the steam jacketed kettles with a gas burner of sufficient capacity to take care of the work. The jackets of the kettles were filled with a high grade oil having a high flash point and when placed in operation greater production wos obtained and the temperature successfully maintained at the desired point. Elimination of the steam boiler lowered the first cost of this installation and has resulted in the equipment being retained for gas.

In conclusion it is always well for the sales engineer to remember that probably 90 per cent of prospects with whom he deals have only the vaguest idea of what the cost of their various plant operations are. Technical details, too, mean but little to the ordinary manufacturer. The industrial gas sales engineer must be able to work out the technical details in order to be sure that the installation will operate successfully and in an economical manner. However, he should be able through salesmanship to close the job without bewildering his prospect with these technical details.

1929 Calendar

Southwest Division Natural Gas Department of A. G. A.—Shreveport, La., January 14-15, 1929.

Southern California Meter Association Hi-Jinks—Rio Hondo Golf Club, near Downey, Calif., January 25, 1929.

American Society for Steel Treating—Los Angeles, January 14-18, 1929.

Western Metals Congress—Los Angeles, January 14-18, 1929.

Western States Metal and Machinery Exposition—Los Angeles, January 14-18, 1929.

Mid-West Industrial Gas Sales Council—Chicago, Jan. 25, 1929.

Advisory Council and Executive Board, A. G. A.—Los Angeles, Feb. 6 and 7, 1929.

Oklahoma Utilities Association—Oklahoma City, March 12, 13, 14, 1929.

Mid-West Gas Association—Minneapolis, Minn., April 15, 16, 17, 1929.

Arizona Utilities Association—Tucson, Ariz., April 18-20, 1929.

Arkansas Utilities Association—Hot Springs, Ark., April 30-May 3, 1929.

Natural Gas Dept. of A. G. A.—Kansas City, May 6-10, 1929.

Pacific Coast Gas Association Annual Convention—Del Monte, Calif., week of September 11, 1929.

American Gas Association—Atlantic City, October 14-19, 1929.

Utilities Association Secretaries of the United States—Chicago, December, 1929.

FOSHAY GAS ORGANIZATION HAS MEETING AT SALT LAKE CITY

Public Utilities Consolidated Corporation, organized under Foshay management to operate utility properties, has adopted a policy of calling regional conferences of its local managers and accountants in order that the personnel may become familiar with company policies. On December 17 and 18 a regional meeting was held at the Utah Hotel in Salt Lake City, arranged strictly as a "gas" conference at which representatives from all of the company's gas properties were in attendance.

E. A. Weston, well known to Pacific Coast gas men and now located at Nogales, Arizona, was a visitor in Los Angeles on his way to the above meeting and upon his return, reporting an attendance of 20 at the meeting. Mr. Weston has been with the Foshay organization for the past six months.

SOCIETY OF GAS LIGHTING IN 52ND ANNUAL MEETING

Geo. G. Ramsdell, secretary of the Society of Gas Lighting, sends word of the 52nd Annual Meeting of that historic organization, which convened at the Hotel Astor, Thursday, December 13th, and elected the following officers:

President—Wm. Cullen Morris.
Vice-President—Alfred E. Forstall.
Treasurer—Wm. J. Welsh.
Secretary—George G. Ramsdell.
Member of Executive Committee—J. Arnold Norcross.
Finance Committee—
Oliver H. Smith, Chairman.
George S. Hawley.
Alexander Forward.

Arizona Utilities Ass'n *to* Meet *in* Tucson *in* April

THE fourth annual Convention of the Arizona Utilities Association will be held in Tucson, Arizona, April 18-19-20 at the El Conquistador Hotel. The Utility Association members are made up of the gas, electric, and water companies of the State. They have also Class "B" members, who are representatives of the electric and gas appliance manufacturers in the State.

The Convention will be three days in duration, the first two days to be devoted entirely to business, and the third day to include a golf tournament and a motor tour, including a visit to old missions near Tucson and closing with a dinner dance in Nogales, Sonora, Old Mexico.

The Convention will be a joint meeting with the Pacific Coast Gas Association and the Pacific Coast Electrical Association.

An attractive program is being arranged for the ladies who attend the Convention, the Ladies Entertainment Committee being headed by Mrs. Max Pooler of Tucson.

M. A. Pooler, vice-president and general manager of the Tucson Gas, Electric Light & Power Co., Tucson, is president of the Arizona Utilities Association. Among the directors of the Association are W. C. Hornberger, vice-president and general manager, Arizona Edison Co., Phoenix; and A. F. Morairty, assistant general manager, Central Arizona Light & Power Co., Phoenix. L. C. McCullough is the secretary.

SECRETARIES ASSOCIATION HAS SEVENTH ANNUAL CONFERENCE

The seventh annual conference of the Utility Association Secretaries of the United States was held in New York City on November 31 to December 2. Membership in the Association is made up of secretaries of national, regional and state utility associations. A feature of this year's meeting was a visit to national headquarters of the American Gas Association, National Electric Light Association and American Electric Railway Association, for the inspection of equipment and office methods and conference with headquarters' staffs.

The Hon. George B. Cortelyou, chairman of the joint committee of National Utility Association and president of the Consolidated Gas Company of New York, attended the secretaries' sessions and addressed them briefly.

E. F. McKay, manager of the Oklahoma Utilities Association, president of the secretaries' group last year, is succeeded by O. A. Weller, budget director of the Public Service Company of Colorado, of Denver, last year's secretary. Harold Buch of Harrisburg, Pa., is this year's secretary. Chicago will be the meeting place for the next conference, dated for December, 1929. Sixty-five secretaries of the United States and Canada attended this year's conference.

MID-WEST GAS ASSN. MEETS APRIL 15-16-17

During the dates April 15, 16 and 17 the Mid-West Gas Association will meet in its 1929 convention at Minneapolis, Minnesota, these dates having been recently fixed at a meeting of the Association's executive council held at Ames, Iowa. Headquarters will be at the New Nicollet Hotel

Upon the resignation of H. R. Sterrett of Des Moines as president, Louis Stein of St. Paul, first vice-president, is heading the Association for the balance of the year.

Within the scope of the Mid-West Gas Association are the states of Iowa, Nebraska, Minnesota, North and South Dakota.

HATZENBUEHLER SUCCEEDS J. D. ROBERTS IN INDUSTRIAL POST

E. J. Hatzenbuehler, assistant industrial engineer of the industrial department, Lone Star Gas Company, for the past two years, has been appointed industrial engineer in charge of that department, succeeding Jules D. Roberts, Jr., who is now associated in an official capacity with the Western Public Service Corporation of Salt Lake City, Utah.

E. J. Hatzenbuehler

Before coming to the Lone Star Gas Company, Mr. Hatzenbuehler was employed with the Dallas Gas Company for five years.

The Lone Star industrial department was created three years ago, and is meeting a large need as a service department to the subsidiary companies.

Largest Holder Put *into* Service *in* Chicago

At eleven o'clock Wednesday morning, December 19, the People's Gas Light and Coke Company, Chicago, held the formal inauguration into service of the largest gas holder ever constructed—a 20,000,000 cubic feet container. The new holder is located at 73rd Street and South Central Park Avenue. Dedication of the holder was the occasion for a brief program of inspection during which Samuel Insull, president of the People's Gas Light and Coke Company, put the holder into official service. A luncheon at the South Shore Country Club followed the program.

This largest of holders, which exceeds by 5,000 cubic feet the largest holders hitherto constructed, is of the waterless type. Not only is the project notable because of the size of the holder, but it stands out as a significant step in gas company cooperation with aviation development. As stated in the formal invitation issued by the Chicago company to the dedicatory ceremonies, "It is the first comparable industrial structure to be lighted and marked in cooperation with federal and local aviation authorities for the benefit of air traffic."

COAST COUNTIES LEAVES SAN FRANCISCO HEADQUARTERS

The general office of the Coast Counties Gas and Electric Company, which, under the presidency of S. Waldo Coleman has been maintained in San Francisco for many years, has now been moved to Santa Cruz. The Coast Counties Gas and Electric Company is now an A. E. Fitcomb property with its stock held by the Pacific Public Service Co., a holding company. J. B. Wilson has assumed the duties of president of the properties.

OAKDALE GAS COMPANY PURCHASE BY PAC. GAS AND ELECTRIC

Pacific Gas and Electric Company has applied to the Railroad Commission of California for permission to purchase from James H. Lyons all of the outstanding capital stock of Oakdale Gas Company (23,000 shares) for the sum of $40,000, and to take over and operate that utility, serving the town of Oakdale and the nearby territory of Riverbank, Stanislaus county, California.

Upward Trend Seen *for* Current Year

factured and natural gas; 8,290,000 cook with coal and wood; 6,000,000 with oil, and 590,000 with electricity.

Data from the American Gas Association and the U. S. Census Bureau show that there are 10,830,000 homes served with manufactured gas and 3,730,000 homes served with natural gas, making a total of 14,560,000 homes. In these 14,560,000 homes connected to gas mains, there are 12,977,000 gas ranges.

The tremendous growth of the by-product coking industry in America has been one of the most interesting developments within recent years. By-product coke has replaced all but 15 per cent of the coke produced in the United States, rising from 27.5 per cent in 1913 to 86.2 per cent in 1927. By the end of next year it is expected that by-product coke will account for 90 per cent of the coke produced in America.

The natural gas industry of America is developing at a remarkable rate. The extension of pipe lines and the development of natural gas producing territory in the Southwest have been phenomenal. A check-up of the population within the natural gas zones reveals an aggregate of about 30,000,000. Within these areas the natural gas industry now furnishes gas service to more than 4,000,000 families and reaches a population in excess of 16,000,000.

The gas industry in all of its extensive ramifications and in all departments is keeping step with the economic changes of the times and, to a greater extent than ever before, is anticipating the needs of the future. The prospects which lie before it are such as to justify every confidence in its continued growth and development and expansion into new and wider fields.

Alexander Forward,
Managing Director, American Gas Associaiton, New York, N. Y.

British Columbia

GAS business in territory served by the British Columbia Electric Railway Company is making steady progress. The increase in gas sales in 1929 is expected to be 15 per cent over 1928. Approximately 60 miles of new mains will be laid and 4,000 new consumers connected in 1929.

New water gas plant purifiers and waterless gas holder, each of three million cubic feet daily capacity, are being erected in 1929 to cope with increasing demand. Percentage of gas sold for house heating is gaining steadily. Vancouver now has over 2,500 heating installations and sells about 17 per cent of gas made for space heating. Industrial and gas refrigeration sales will show big gains in 1929.

W. G. Murrin,
President, British Columbia Electric Railway Company, Ltd., Vancouver, B. C.

Chicago

PROSPECTS for the manufactured gas business in 1929, in this part of the world, are good: not spectacularly brilliant—it is not that kind of a business—but good. The Peoples Gas Light and Coke Company of Chicago has indicated its view-

(Continued from Page 18)

point by putting into service last week a "waterless" holder of 20,000,000 cu. ft. capacity, by making contracts for materially increasing its 1929 purchases of coke oven gas produced in connection with the steel industry, and by providing for 1929 an investment budget of approximately $4,000,000.

January 1 figures will show perhaps better than a seven per cent increase in the 1928 gas sales of the Peoples Company over the 1927 total. Handsome increases have been made in sales of gas for industrial and for house heating purposes, substantial increase for hotel and restaurant purposes and some increase for domestic purposes. Gas motivated refrigeration is helping and will grow. Gas for a multitude of industrial heat treating processes for large volume water heating and for house heating are especially promising outlets.

Bernard J. Mullaney,
Vice President, The Peoples Gas Light and Coke Company; Vice President, American Gas Association, Chicago, Illinois.

Mid-Continent Area

THE development of the natural gas industry in the mid-continent area during the year just closed has been most remarkable. Increasing demand for natural gas on the part of the public called for an enormous construction program the past two or three years and indications point to continued activity during 1929. Much progress is being made from an economic standpoint. Natural gas companies are cooperating with state authorities in the matter of conservation of the natural fuel. Leakage in main line deliveries is being reduced to a minimum.

Splendid support is being received from state utility associations and the officers of the southwestern division of the Natural Gas Association.

This concerted effort on the part of the leaders in the industry has brought about a spriit of good-will and I feel the gas operations for 1929 will be profitable as well as exceedingly pleasant.

H. L. Montgomery,
General Manager, Empire Natural Gas Company, Bartlesville, Oklahoma.

Natural Gas Men Confident

THE year 1928 has been outstanding in the history of the natural gas industry. Production and sales have continued to increase at a comparatively rapid rate. The industry, particularly in the Southwest, is experiencing an era of material expansion. Among the outstanding accomplishments are the construction of several large pipe lines to carry natural gas long distances and, in many cases, to towns and cities not previously supplied with natural gas.

During the year, the Natural Gas Department has allied itself even more closely with the American Gas Association, resulting in an interchange of experiences and ideas which must result in greater benefits to the gas companies and to the public which they serve.

We look forward to the year 1929 with confidence that the natural gas industry will continue to expand its service to the gas consuming public with an increasing appreciation of its importance and value.

S. W. Meals,
Chairman, Natural Gas Department, American Gas Association, Pittsburgh, Pa.

Southern California

IN SOUTHERN CALIFORNIA the outlook for the coming year in the gas industry indicates a substantial increase in business of all classes.

In order to give better service to the gas-consuming public, a substantial effort should be made to replace inadequate and obsolete appliances with new and approved appliances, and better and more effective methods of application and usages of gas should be adopted.

United effort by the entire gas industry should be made to co-operate with State Departments and oil companies in solving the problem of waste of gas from wells producing both oil and gas. If this is not done, the time will be much shorter in coming when there will not be sufficient natural gas to meet all requirements, and the return to manufactured or mixed gas made necessary.

The Southern California Gas Company plans for the year 1929 to increase its activities in order to maintain a gas reserve to meet the needs of all of its patrons and to increase its new business and service departments, in order to give all domestic, commercial, and industrial consumers the best of service, and to supply them with appliances best suited to their needs and information as to the best way and methods of using them.

A. B. Macbeth,
President, Southern California Gas Company, Los Angeles, Calif.

More Construction

I AM looking forward to a prosperous and satisfactory business year and have planned the conduct of our companies on that basis. As evidence of our confidence in the business situation, I might sum up the whole thing by saying that we have planned to spend more money during the coming year on new construction than we have ever done before in the history of our companies.

Henry L. Doherty,
President, Cities Service Gas Company, New York, N. Y.

Middle West

SATISFACTORY progress for gas companies in the middle west is expected for 1929. Business is more settled, employment good, and with the same aggressive attitude we may expect a reasonable trend. Each year finds gas more and more

generally recognized as the super fuel with new uses discovered in the industrial and commercial fields and an extension of uses in the domestic field. We are finding a ready acceptance of these new uses which has been brought about, in a measure, by more intensive and effective selling methods, necessary to meet the highly competitive conditions of the day.

G. B. Evans,
President, The Laclede Gas Light Company, St. Louis, Missouri.

San Diego

IN THE San Diego territory gas production and transmission facilities have, during the past year, received major additions, in order to keep up with the rapid growth of the community. During the coming year this rapid progress is expected to continue and our company, as always, will so increase its facilities as to be ready at any time to take care of the increased load. Gas house-heating continues to gain in popularity. In combined safety, cleanliness, convenience and economy, it is without a rival, and it will finally sweep the field as inevitably as it has in the kitchen for cooking and water heating.

L. M. Klauber,
General Superintendent, San Diego Consolidated Gas and Electric Company, San Diego, Calif.

Load Building Is Keynote

THE year 1928, after a somewhat slow start, resolved itself into another period of prosperity for the nation as a whole, in spite of pessimistic predictions that business would be adversely affected by the pressure and interest of a presidential campaign. The public utilities in general contributed their share to this prosperity by supplying greater service to the public at progressively lower rates. . . .

The nation's business, including the public utilities, seems to be destined for another year of new records in progress and prosperity. . . .

In the development of new business the utilities are moving rapidly ahead. No possibilities are being overlooked to add load to the lines of both electric and gas companies. . . . The gas companies also are developing new business rapidly, with particular emphasis on the domestic heating and industrial load. If it ever was true that the utilities approached their sales problems in a haphazard manner, that day certainly has passed. Today new business development in the public utility industry centers around a careful study of the public need for service, close analysis of the markets and intensive, co-ordinated effort to build up the load. The object is to utilize more efficiently the investment in the industry and to increase the usefulness of the service to the public.

John J. O'Brien,
President H. M. Byllesby and Company, Chicago, Illinois.

Montana

NEARLY the entire part of Montana east of the Rocky Mountains is now served with natural gas and there are only two manufactured gas plants left in the state. The fields which have been developed during the past year are very extensive and plans are under way to serve many more cities with natural gas during the coming year and to extend gas lines far outside of the state.

The natural gas companies operating most extensively in the state are the Ohio Oil Company in Billings and adjacent territory, the Montana-Dakota Company in the entire eastern section of the state, and the Great Falls Gas Company and the Great Northern Utilities Company in the north central part. The largest gas fields developed are the Kevin-Sunburst near Shelby and the Baker fields in the southeastern part of Montana.

A. H. Sikes,
Manager, Great Falls Gas Company, Great Falls, Montana.

The Industrial Market

THE year 1928 in the mid-continent section has been remarkable on account of the way in which the industrial markets for natural gas have been developed. The production has been such as to warrant the development of the industrial market in this territory and the present pipe lines now furnishing this territory have been so extended and their capacity so increased that the coming year should show a very remarkable increase in the use of natural gas for househeating and industrial purposes.

T. J. Strickler,
Vice-President and General Manager, Kansas City Gas Company, Kansas City, Missouri.

General Sales Activity on Coast

I AM more optimistic regarding the appliance sales possibilities for 1929 than in any past period. More serious thought is being given to sales problems on the part of the gas company executives than ever before, recognizing as they do that the real future of the gas industry lies in the hands of the sales department.

Nearly every gas company on the Pacific Coast is now engaged in the sale of appliances, and with all these factors active in the field, as they have not been in the past, a greater volume of business is assured.

The Vancouver Gas Company of Vancouver, B. C. recently opened the largest and finest appliance display building in the western country—a recognition on the part of the management of the necessity of presenting the industry in the most favorable light to the public.

The Washington Gas & Electric Company in all of its properties is more active in the sales department than in any period in its past history.

The Public Service Building in Portland, Oregon, which houses the Portland Gas and Coke Company, is the last word in adaptability to the proper display of gas appliances.

The Pacific Gas and Electric Company is now actively engaged in the sale of gas appliances in all of its properties.

The Southern Counties Gas Company and the Southern California Gas Company, operating in their respective fields, are doing a wonderful job. Merchants are showing an increased interest, and unquestionably their volume of business will be larger, owing to the creative activity of the public utility in the various sections of the Coast.

With the advent of natural gas into the Northern California territory, this is bound to stimulate greater public interest and increased sales are bound to result.

This is a brief resume of the situation, and from it may be based the prophecy that 1929 should be a great year for the Gas Industry on the Pacific Coast.

C. B. Babcock,
President, C. B. Babcock Company, San Francisco, Calif.

Portland

PORTLAND Gas and Coke Company will go into the new year with an aggressive drive for new business based principally on a tariff designed to permit competition with other fuels and making substantial reductions to consumers who depend entirely upon gas for fuel. Special commodity rates have been established with a discount for off-peak service. . No large construction program is scheduled since the territory served is covered and the plant capacity is ample at this time. Nineteen twenty-nine should be for this company essentially a year of commercal activity.

E. L. Hall,
General Superintendent, Portland Gas and Coke Company, Portland, Oregon.

Eastern Washington

EASTERN Washington is now enjoying greater business prosperity than it has since 1910. Based on 1928 earnings, I predict our company will continue to reflect in its 1929 earnings this business improvement.

In Spokane, industrial uses for gas will keep pace proportionally with the nation's increasing demand for gas in the industry.

There is a decided tendency for improved conditions in the home as evidenced by the increasing interest of our customers in installing equipment which enables them to have hot water on tap and automatic temperature control gas furnaces.

People are fast realizing that the increased cost of this service is by far offset by the added convenience and improved health conditions.

Jas. L. Stone,
Vice-President and General Manager, Spokane Gas and Fuel Company, Spokane, Wash.

Abundant Supply

GAS rates in the Los Angeles area have been reduced substantially, and there apparently is an ample supply of natural gas available for use in this territory. It is logical to conclude that these two stimuli of low price and abundant supply will tend to produce an increase in gas consumption.

The appliances of all our consumers have been adjusted to natural gas utilization. This should popularize gas service, and conduce to the fullest use of gas in appliances already installed, as well as encourage the installation of new appliances.

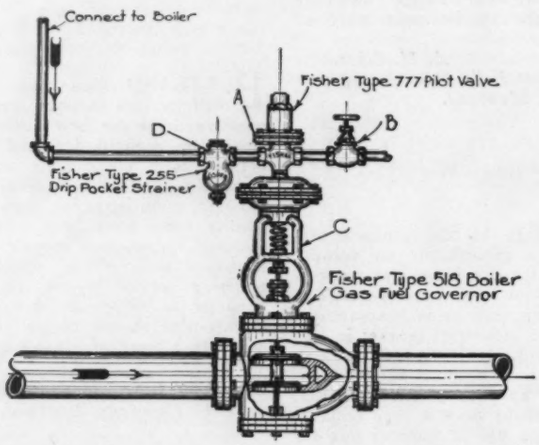
There are two potential markets for additional gas: new consumers, and new applications by old consumers. The number of new consumers is not to any considerable degree subject to our control; but the extension of gas to new uses can be materially

(Continued on Page 42)

Fisher Pilot Operated Boiler Gas Fuel Governor

THE Fisher Governor Company offers a new type of governor in their design of a pilot controlled Boiler Gas Fuel Governor Type 519.

The body of the regulator is constructed to provide maximum gas flow with minimum pressure drop. The valve ports are provided with an internal contour construction providing for stream line flow of gas through the body.



The pilot unit consists of a strainer, employed to keep dirt and pipe scale from the pilot valve, and needle valve. The pilot valve may be of an entire bronze construction, with laminated bronze diaphragm, or may be fitted with steel or corrosion resisting alloys for corrosive service. Units are built for operating pressurers up to 500 lbs., and are adaptable for all gas fuel governor sizes.

The control connection is connected directly to the boiler, and pilot set for the service pressure desired by adjusting the adjustment nut on top of the Type 777 Pilot. The main valve spring is given tension to provide a positive opening of the governor when the pressure is removed from the diaphragm. As the boiler pressure builds up, exceeding the setting of the pilot control, the pilot opens, allowing pressure upon the main diaphragm. Upon the dropping of the boiler pressure, the pilot closes, and the pressure on the diaphragm is bled off through a cracked needle valve, the spring of the main valve opening the governor, allowing more gas to the burner.. The bleed from the needle may be piped to the burners or to the sewer. The fuel governor never closes completely, being so adjusted at the factory that the main valve ports are always cracked open, allowing sufficient gas to pass to maintain a pilot light burning. Complete operation, opening and closing will be obtained with about one pound pressure change at the point of setting of the pilot valve.

The pilot is also applied on pressure regulators and relief valves where a sensitive control is desired. When the units are desired for any particular service, the manufacturer should be advised fully of pressures, temperatures, pipe size, and operating medium.

Paper Making *as* Applied *to* Gas Measurement

(Continued from Page 35)

or contract across the grain of the paper, and not with the grain. A chart made from this stock if placed under instruments will usually be found to be eccentric and the chart therefore inaccurate.

Paper made with the fibres interlaced will cause the paper to expand or contract uniformly in all directions and to a less noticeable degree. A light weight Bristol Board suitably sized, made with this formation has proven most satisfactory.

Another problem encountered when the ordinary papers usually carried in stock by paper jobbers is used is that the sizing is often unsuitable for the recording ink. There is carbolic acid used in this ink which often cuts through the surface sizing and forms a blot, sometimes exhausting the ink and making a very inaccurate record. The mill chemists have produced a new sizing which resists the action of the carbolic acid and this difficulty has been minimized.

NEW COMPRESSOR ANNOUNCED BY INGERSOLL-RAND

Ingersoll-Rand Co., 11 Broadway, New York City, announces a new direct-connected, gas-engine-driven compressor. It is designated the Type XG, and is being introduced following several years of development under operating conditions. It consists of a 2-cylinder, 4-cycle gas engine, direct connected to Ingersoll-Rand compressing cylinders with I-R plate-type valves.

Features of the XG are its rugged construction, accessibility of frames and running gear, and economy of floor space and foundation requirements. The compression end can be furnished to accommodate any of the usual conditions of pressure range. The XG is adapted to continuous service in the oil and gas industries, or to general industrial use. It is described in Bulletin 3149, available on request to the company.

FOUNDATION WORK PROCEEDS ON B. C. ELECTRIC HOLDER

Foundation work on the new gas holder which is being erected by the B. C. Electric Railway Company at Vancouver, B. C., is now being pushed ahead with all speed. The contract for this work allows for a cost of $72,000. Concrete piles are now being driven to carry steel girders for the new holder, which will have a capacity of 3,000,000 cubic feet.

W. G. MURRIN NOW HEAD OF B. C. ELECTRIC

W. G. MURRIN became president of the British Columbia Electric Railway Company, Limited, of Vancouver, British Columbia, on January 1, 1929, succeeding George Kidd, who on that date became chairman of the board of the British Columbia Power Corporation, the holding company for the British Columbia Electric Railway Company, Ltd. Mr. Murrin held the post of vice-president of the company until his appointment as president, and the merited honor comes to him in recognition of a period of efficient service with the company.

W. G. Murrin

TWO INDUSTRIAL ADVERTISING FIRMS IN MERGER

Merger of the McCarty Company and the Robert R. Berry Company, both of Los Angeles, was announced late in December, both firms being prominent in the field of industrial advertising. Terrell T. McCarty is president of the new company, which will be operated under his name. Robert R. Berry becomes vice-president and chief account executive of the agency. All features of advertising counsel and service are included in the activity of the McCarty Company, which retains offices in the Transportation Building, Los Angeles. For years both of the firms now amalgamated have rendered advertising assistance to leading manufacturers of petroleum and gas industrial equipment.

ST. JOSEPH CONSUMERS BEING EDUCATED TO NATURAL GAS

Incident to the change-over from manufactured to natural gas service in St. Joseph, Missouri, the St. Joseph Gas Company is conducting an educational campaign on the proper use of natural gas, informing consumers of the company's plans, which involve readjusting all appliances in the city. Fred Karr of the Gas Service Company, Kansas City, is in charge at St. Joseph temporarily and states that the company anticipates making the change-over without annoyance to users. A corps of workmen is being called in from adjoining cities to conduct the appliance adjustment program.

MEMPHIS LINE READY FOR USE IN NATURAL GAS SERVICE

The new gas line from the Monroe fields of Louisiana to Memphis, Tenn., constructed by the Memphis Natural Gas Company, has been completed and is now being tested with gas. The line, which will supply gas to Memphis and to other cities along the route, was completed four weeks ahead of schedule, according to announcement of Ford, Bacon and Davis, the contractors.

Memphis Natural Gas Company will sell gas in Memphis to the Memphis Power & Light Company. It will also sell to the Mississippi Power & Light and to the Arkansas Power & Light, in the Couch utility group.

Laboratory Approval Seal Recommendations

WITH much interest the gas industry has awaited the report of the A. G. A. Committee on Economic Aspects of the Laboratory Approval Seal, of which M. J. Mullaney, vice-president of the Association, was chairman. The committee's report was accepted late in November by the Executive Board of the American Gas Association and its recommendations are now being placed generally before the industry.

Outstanding is the decision that henceforth the symbol or insignia of a gas appliance, indicating that it has been tested and approved by the Testing Laboratory of the American Gas Association, shall be referred to as the Laboratory Approval Seal and not as the Blue Star Seal.

Other recommendations approved by the Executive Board follow:

"Second, that hereafter in connection with the appearance of the Laboratory Approval Seal on any gas appliance, there shall be used along with it a legend reading substantially as follows:

" 'This Laboratory Approval Seal is a guarantee of compliance with basic national requirements for safety—American Gas Association, Inc.'

"Third, it is recommended that the manufacturers, in presenting their appliances for test by the testing laboratory, shall hereafter, by way of making these recommendations effective, be required to agree that in their sales work and exploitation of their appliances they shall comply with the findings that have been made as to the use of the legend or the interpretation of the legend, and shall not exploit the seal as a commercial mark of quality."

It is further recommended in the report that the manufacturers of gas appliances constitute themselves a "vigilance committee" and check up on how the exploitation and use of the seal is carried on by manufacturers, dealers and by gas companies. If infractions of the general policy agreed upon are reported, it is understood that the Laboratory Managing Committee in conjunction with the Association counsel will take such steps as may be deemed expedient or possible to prevent and stop misuse of the seal, subject to the Executive Board's approval.

2,000 Attend Opening *of* Hot-N-Kold Shop

FORMAL opening of the Hot-N-Kold Shop of San Francisco at 417 Sutter Street was held the week ending December 15th and was attended by over 2,000 guests and prospective purchasers of gas or electric equipment.

Door prizes were given away, and a prize drawing was held the closing night of the exhibit at which a radiant type gas heater, an electric refrigerator, and six other prizes were presented. The Hot-N-Kold Corporation has been using radio to a considerable extent in connection with sales promotion activities, and the result was that most of those who attended the opening were actual prospects rather than mere curiosity callers. This was strikingly demonstrated by the fact that the woman who won the electric refrigerator traded it in for a larger model at almost double the price, paying the difference in cash.

"The Hot-N-Kold Radio Review" is a Tuesday night feature over KFRC from 10 to 11 p. m., and in the opinion of the officials of the Hot-N-Kold Corporation, is a very valuable medium for bringing interested parties into the stores.

SOUTHERN COUNTIES SALES GO OVER TOP BY $100,000

Clyde Potter, general commercial agent for Southern Counties Gas Company, Los Angeles, announces that on December 15, the new appliance sales by his organization had exceeded the quota for the year by almost $100,000. Appliances sold by this company include ranges, hot-water heaters, space heaters, refrigerators, incinerators, furnaces, radiators, percolators, waffle irons, corn-poppers, toasters and many types of industrial equipment.

Early in January the entire sales and managerial organization of Southern Counties Gas Company will celebrate the 1928 record-breaking sales of gas appliances at a "Turkey and Bean" dinner. During the year an inter-district contest on sales was conducted. Four of the company's eight districts were paired against the other four in this contest with four competitions going at the same time—winners to be determined on the basis of results as related to quotas. The four losing districts will eat beans at the coming dinner and at the same time provide turkey with all the "fixins" for their winning competitors.

FORT WORTH HELIUM PLANT TO CLOSE IN JANUARY

The Government helium plant at Fort Worth, Texas, will close in January, according to press reports which state that funds for the operation of this plant were not included in the Commerce Department's appropriation bill.

The total appropriation for the production of helium is $170,800. This amount is divided into two items, $95,800 for the new helium plant at Soncy, Texas, near Amarillo, and $75,000 for helium production and investigation. The bill reported to the House of Representatives also authorizes the Bureau of Mines to acquire the gas mineral rights to approximately 14,000 acres near Amarillo, for a sum not to exceed $500,000.

CHAIRMAN ANNOUNCES NATURAL GAS DEPARTMENT CONVENTION

Official announcement has been made by Samuel W. Meals, chairman of the Natural Gas Department, that the Annual Convention of the Department will be held in Kansas City, Mo., May 6 to 10, 1928. It is expected that the meeting in May will surpass in attendance the one held in Dallas last May, since Kansas City is centrally located.

VALLEJO PLANT TO HAVE NEW PURIFICATION APPARATUS

Plans have been drawn and construction work will be started shortly on a new liquid purification apparatus for the Vallejo plant of the Pacific Gas and Electric Company.

Absorbers, emulsifiers, emulsion tanks and necessary piping and other equipment will make a total contract of about $24,000.

As in other installations of this nature, the oxide boxes are retained for the final removal of any trace of sulphur which might remain at the conclusion of the liquid process.

P. G. AND E. STOCK ISSUE IN AMOUNT OF $7,111,250

Pacific Gas and Electric Company has applied to the California Railroad Commission for authority to issue and sell 284,450 shares of its common capital stock, par value $25 per share, or a total of $7,111,250, to its stockholders as of record at the close of business February 8, 1929, in the ratio of one share of new stock for each 10 shares already held. The proceeds from the sale of said stock are intended to finance in part unreimbursed capital expenditures on the P. G. and E. system and that of Mt. Shasta Power Corporation, and also to apply on new expenditures during the first quarter of the year 1929, aggregating $20,126,187.10.

W. D. COLLINS CHIEF ENGINEER OF SERVEL, INC.

Announcement was made January 1, 1929, that W. D. Collins, who has been acting chief engineer for Servel, Inc., will become chief engineer, with complete charge of all Servel engineering.

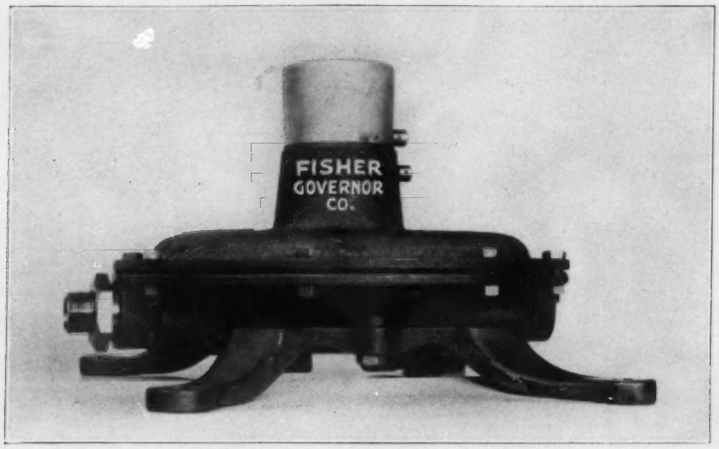
Mr. Collins has been with the Servel organization since January, 1926, coming to them as assistant engineer on refrigeration, automobile bodies and gas engine production.

LITTLETON FRANCHISE GRANTED TO PUBLIC SERVICE COMPANY

Littleton, Colorado, in an election held late in November franchised the Public Service Company of Colorado to serve natural gas in that community. The franchise is for 20 years, gas service being expected within six months.

NICOLL FRANCHISED IN WHITE CITY, KANSAS

White City, Kansas, has granted a gas franchise to C. A. Nicoll. The holder of the franchise agrees to have gas piped into the city by next spring.



Regulators for Use *with* Liquified Petroleum Gas

THE Fisher Governor Company has recently designed a regulator for use with liquified petroleum gas.

The illustration shows construction of the regulator. The gas enters at the inlet, this connection being the standard for high pressure gas tanks, passes through a small orifice to the operating chamber of the regulator. When the pressure is reached that overcomes the downward thrust of the adjusting spring, the diaphragm and plate move upward, tending to straighten out the toggle spring, which in turn causes a lateral movement of the self-aligning valve to the seat. The valve disc is a composition, according to the makers, unaffected by a liquid or gaseous propane and butane. A propane gas resisting material is used for the diaphragms.

The valve is built in three diaphragm diameter sizes, namely the 7½-inch Type 716, the 9½-inch Type 708, and the 11-inch Type 701.

The regulators are fitted with adjusting spring, giving a reduced pressure range between 4 inches and 16 inches water pressure. The spring adjustment nut is protected by an aluminum or brass cap, held against the spring case by a set screw, preventing a change of pressure by irresponsible parties.

The regulators have a maximum capacity of about 1400 cubic feet per hour.

Use California Oxide

to Remove Hydrogen Sulphide from Gas

This highly potent commercial compound has been developed after years of research and exhaustive test by Los Angeles' foremost chemists—Arthur R. Maas and Norman R. McKee.

California Oxide is used extensively by large gas companies for removing Hydrogen Sulphide from gas at low cost, with highly efficient results.

California Oxide Co.

308 East Eighth Street

Los Angeles

Phone: TRinity 0769

EL PASO PROJECT FINANCING NOW PROCEEDING

Financing the 200-mile 16-inch natural gas pipe line from Lea county, New Mexico, to El Paso, is under way following the recent formation of the El Paso Natural Gas Company under the laws of Deleware.

The company will have, when the financing is completed, a capitalization of $7,000,000 in authorized 6½ per cent first mortgage sinking fund bonds. Of this amount $3,500,000 will be outstanding. Six and one-half per cent 10-year convertible debentures, all outstanding, will be issued to the amount of $1,750,000. Five million dollars in authorized 7 per cent cumulative preferred stock will be issued at a $100 par value. Of this $600,000 will be outstanding. Also, 92,500 shares of the 175,000 shares of no par common authorized, will be outstanding.

The construction contract on the line calls for it to be completed before May 1st, 1929.

ROSWELL, N. M., SOON DUE FOR GAS THROUGH 45-MILE LINE

The 45-mile natural gas line from which will come gas from the Artesia oil and gas field of New Mexico to Roswell, is expected to be completed around January 15. The line is being constructed by the Pecos Valley Gas Company which will deliver the gas at Roswell to the Southwestern Public Service Company, holder of the natural gas franchise. It is understood that the cost of the line will be approximately $250,000.

Upward Trend *in* 1929

(Continued from Page 39)

encouraged by judicious promotional effort. In our territory we regard house heating as the most promising field for development.

Addison B. Day,
President and General Manager, Los Angeles Gas and Electric Corporation, Los Angeles, Calif.

MARKET IMPROVEMENT DUE

OUR forecast of natural gas industry in this section of the country for the year 1929 is that a quiet condition will prevail for at least part of the year due to demoralized condition of fuel oil market and inability of natural gas companies to compete with distressing oil prices in territories conttiguous to refineries. We anticipate this condition will improve as the year progresses. This condition also may curtail somewhat pipe line extensions until conditions improve. We believe all companies are well supplied with available gas and with gas reserves. In general natural gas industry is in good healthy condition.

Frank L. Chase,
Vice-President, Lone Star Gas Company, Dallas, Texas.

CALIFORNIA NATURAL GASOLINE

NATURAL gasoline production for California during 1929 will perhaps show an increase of 30 per cent over the production of the preceding year. This increase will be the result of additional production from Signal Hill, Santa Fe Springs, Kettleman Hills, Lawndale, and other fields. In spite of this large increased production, however, 1929 promises to be a prosperous year for the industry, inasmuch as it appears probable that a greatly increased demand will take care of what would otherwise be an enormous surplus. This increased demand will be the result of an increase in the volatility of motor fuels generally and an increased demand for export gasoline and anti-knock gasoline containing high percentages of natural gasoline.

In order to prevent a surplus and make demand equal production, however, it will be necessary for the industry to produce only a stable product, the distillation recovery on which should average between 90 and 94 per cent.

Geo. L. Ratcliffe,
President, California Natural Gasoline Association, Los Angeles, Calif.

SEE GROWTH IN 1929 NATURAL GASOLINE DEMAND

PRODUCTION of natural gasoline in 1929 promises to be slightly greater than in 1928. This increase is mostly accountable for by increased activities and developments in California. Against this increase is a promise of record demand for natural gasoline arrived at in three ways, namely, record demand for motor fuel, greater demand for more volatile gasoline, and the large amount of natural gasoline needed for blending with the increased production of low gravity gasoline made from West Texas crude. We expect to find a strengthening in prices this summer similar to the increase which developed last summer.

H. A. Trower,
President, Natural Gasoline Association of America, Bartlesville, Oklahoma.

Johnson Gas Appliance Co. Offers New Urn Burner

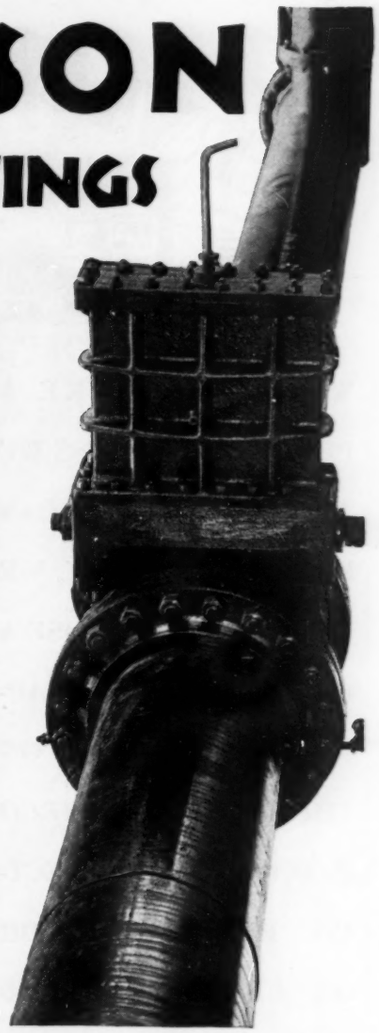
A NEW style urn burner, together with a new automatic thermostatic control are both a part of the 1928 offering of the Johnson Gas Appliance Company. The burner is designed so that it may be placed near the urn or steam table. The construction and adjustments of this burner embody the Johnson principles applied in former models, but is entirely new in design. The burner is equipped with the Venturi tube. Gas port holes are drilled around the side, which directs the heat out over the bottom of the urn. The burner head is 2½ inches in diameter and has a large opening in the center which provides secondary air. The adjustable air shutter permits adjustment

of the air supply. The hood adjusting cap with direct jet regulator makes an adjustable gas orifice. The new thermostatic control is automatic, keeping the coffee or water just below the boiling point.

ROBINSON
ORIFICE FITTINGS

...fast eliminating the old style by-pass throughout the oil and gas industry!

ISN'T it logical that a single unit which replaces many expensive and bulky items of equipment should become popular at once with progressive oil and gas men? That's exactly what the ROBINSON Orifice Fitting does and explains why there are over 11,500 in use today. Note in the illustration how compact the fitting is; how little space it occupies compared to an old style by-pass. Plate changing is simple; measurement accurate, and safety to men assured. Our new catalog offers the proof and gives the details. Send for it TODAY.

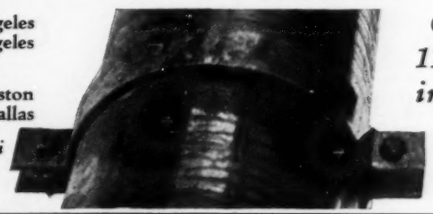


ROBINSON ORIFICE FITTING COMPANY
1435 SANTA FE AVENUE · LOS ANGELES, CALIFORNIA

California Representatives
Westcott & Greis, Inc. - Los Angeles
Jensen Instrument Co. - - Los Angeles

Mid-Continent Representatives
B & A Specialty Co., Tulsa & Houston
Westcott & Greis, Inc., Tulsa & Dallas

Representative East of the Mississippi
The Foxboro Company



Over 11,500 in use

HOYT-WOOD MFG. CO. IS NAME OF MERGED COMPANIES

Announcement has been made of the merger of the Hoyt Heater Company and the Pacific Coast interests of the John Wood Manufacturing Company, effective January 1, 1929. Both firms have been engaged in manufacture and sale of water heaters for a number of years. The new company will be known as the Hoyt-Wood Manufacturing Company, a California corporation operated under the direction of E. S. Hoyt, Jr., president; R. C. Hoyt, vice-president; and George L. Howard, secretary and treasurer. Frank Sutcliffe, president of the John Wood Manufacturing Company and the Metal Ware Corporation, and J. F. Dunn, Pacific Coast Manager of the John Wood Manufacturing Company, are on the board of directors of the new firm, in addition to the above officers. E. S. Hoyt was formerly president of the Hoyt Heater Company.

COOPER CALENDARS OUT IN 1929 VERSION

C. & G. Cooper Company, Mount Vernon, Ohio, has issued the 1929 number in its series of attractive calendars. A Cooper calendar may be obtained by addressing the company at the Mount Vernon headquarters.

PORTLAND EMPLOYEES GIVEN 20% OFF ON MOTOR PRODUCTS

Employees of the Portland Gas and Coke Company, Portland, Oregon, have the advantage of being able to purchase "Gasco Motor Fuel" tickets at a four cents per gallon discount—a 20 per cent saving—through the company's arrangement. The tickets apply not only to Gasco Motor Fuel, which is made by the company, but to motor oil purchased at company stations, and to anti-freeze solutions for automobile radiators during the winter season.

VICTOR WELDING EQUIPMENT CO. NEW FIRM NAME

"The Victor Welding Equipment Company" is the name of the new corporation which has been formed with $100,000 authorized capital stock as the successor to the Victor Oxy-Acetylene Equipment Company, San Francisco. L. Stettner is president of the new corporation, and E. L. Mathy is vice-president and director of sales. The new company has an ambitious program of expansion which is already under way.

NORDSTROM SERVICE COCK IS DESCRIBED IN CATALOG

In last month's issue of *Western Gas* an item appeared on the Type R Nordstrom Valve.. This valve has been changed in name to the Nordstrom Service Cock.. It is designed for meter and curb service and is fully described in the new Merco-Nordstrom catalog, recently issued.

WE NEVER MAKE A PROMISE . . . UNLESS WE ARE POSITIVE WE CAN KEEP IT. FRANKLY, WE WOULD RATHER LOSE A CLIENT THAN DISAPPOINT HIM EITHER ON THE QUALITY OF *ARCO* PAINTS AND PROTECTIVE PRODUCTS . . . OR ON GETTING HIS ORDERS TO HIM ON TIME. YOU CAN DEPEND ON *ARCO* TO MAKE GOOD EVERY PROMISE.

THE ARCO COMPANY
CLEVELAND, OHIO

Pacific Coast Branch
116 New Montgomery St.
San Francisco, Calif.

Branches and Warehouses in Principal Cities

(196)

ARCO

Paints . Varnishes . Enamels . Lacquers

Pacific Coast Branch *for* Mine Safety Appliances

The Mine Safety Appliances Company, Pittsburgh, Penna., announces the opening of a Pacific Coast Branch, including offices and warehouse, at 318 East Third Street, Los Angeles, California. The Pacific Coast Branch is in charge of H. E. Munn, who received his early safety training with the United States Bureau of Mines and later was associated with the Jacklin metal mining interests. Mr. Munn is assisted by C. E. Gault, also formerly associated with the United States Bureau of Mines. The Pacific Coast Branch carries a stock of M-S-A safety apliances, including Burrell All Service gas masks, hose masks, McCaa oxygen breathing apparatus, H-H Inhalators, Edison Electric Safety Cap Lamps, etc., and is well equipped for emergency services.

In additiion to the Pacific Coast Branch, the Western Organization of M-S-A also includes the following district representatives: J. C. Calnon, El Paso, Texas; T. R. Jones, Denver, Colorado; V. O. Murray, Salt Lake City, Utah; and H. H. Sanderson, Seattle, Washington.

Oklahoma Natural's Merchandising Meets Success

By CRAIG ESPY
Mid-Continent Manager, Western Gas

THE fact that the Oklahoma Natural Gas Corporation of Tulsa was to merchandise gas appliances became generally known about the time that the company moved into its new 10-story office building, early in the fall.

Almost as great as was the change from the old building to the new, is the change from the old policy on gas appliance selling to the new. Formerly, a few appliances were casually displayed at various offices over the Oklahoma Natural system, and questions answered regarding them. Now, aggressive sales effort is put forth, backed by a keen appreciation of the part that quality appliances play in the scheme of keeping customers satisfied.

The decision to sell quality merchandise was among the first to be arrived at by the general sales manager, N. A. Newton, appointed to that post from another position with the company. Another was that of standardization, the selling of the same appliances in all towns. The company in so doing is enabled to buy appliances in carload lots to be shipped from Tulsa to the five districts into which the state has been divided.

The key towns in these districts are Tulsa, Oklahoma City, Enid, Muskogee and Ardmore. San Angelo, Texas, is the point of distribution for the company's system in Texas.

No method, perhaps, is so effective for notifying the general public that a company is actively engaged in merchandising, as is the campaign method.

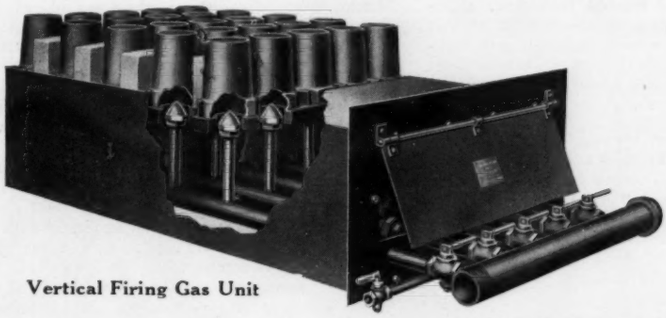
Hence the Oklahoma Natural entered into its first merchandising campaign the second month of the existence of the merchandising department. This pioneer campaign was put on in Tulsa and Oklahoma City and a total of 105 ranges were sold. The organization of the sales department in the two towns is essentially the same, and the campaign was conducted in each town after the same manner.

Each city is divided into 10 districts, with a salesman in each district who is permanently assigned to that territory. He re-

THE LEAHY MULTI-JET UNIT

for

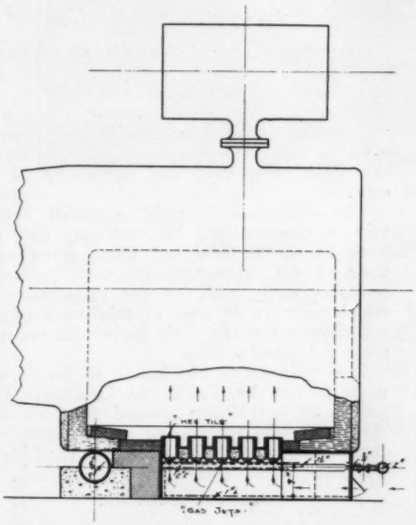
Oil Field Boilers



Vertical Firing Gas Unit

Vertical Firing

Under Portable Type Locomotive Boilers



Side Elevation Showing Method of Installing Vertical Firing Unit under Oil Field Portable Type Locomotive Boiler.

Gas Unit for Oil Field Service with the following very important Features:

1—An efficient, indestructible, portable burner having a low selling cost.

2—Low installation and up-keep cost.

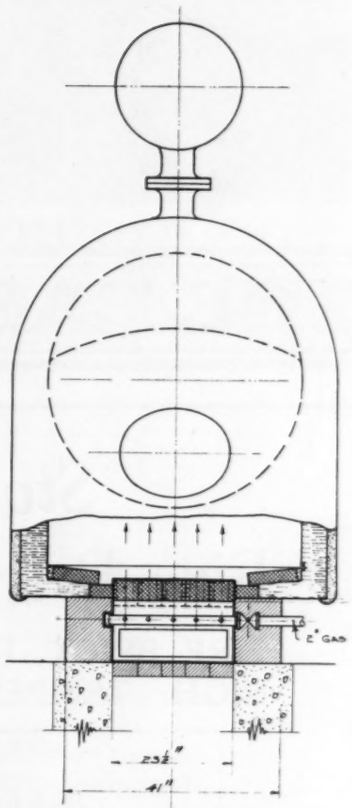
3—Constructed so that it can be installed quickly and removed rapidly and cheaply from one job to the other.

4—Complete combustion and slow travel of the gases within the fire-box and boiler flues.

5—Low stack temperatures.

6—A burner that will develop high overloads on very low gas pressures.

7—In emergency needs oil can be used in conjunction with the unit.



Front View Showing Vertical Firing Unit in position.

Note: Compactness of unit, simplicity of installation, and few brick required.

Write for Bulletin 19B and 19C

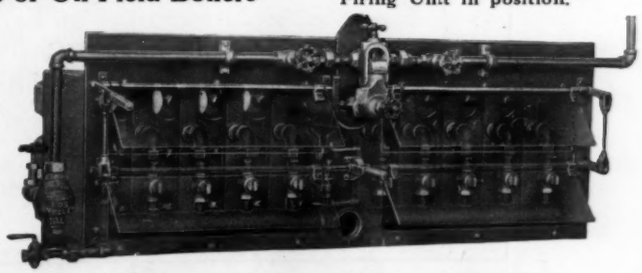
For the Burning of Gas and Oil under all types of Oil Field Boilers we recommend

Horizontal Firing

For Return Tubular Boilers and all types of Portable Locomotive Boilers.

For a detailed description of our Horizontal Units

Request Bulletins 19A and 19D



Horizontal Unit—Combination Oil and Gas

LEAHY MANUFACTURING CO.

1804-1810 EAST EIGHTH STREET, LOS ANGELES, CAL., U. S. A.

Established in 1902

The TRENCHER *that* Earns its Keep *for* Gas Distribution

HERE's a real **usable** trencher, especially adapted to the needs of the gas industry. Extremely mobile and compact, you'll find it the most convenient and economical method of excavating trench for your lines.

It is so quickly moved from location to location, and requires so little elbow room, that you can apply machine-trenching economy to a far greater proportion of your jobs. That's why we say it earns its keep. You should know more about this valuable piece of equipment. Write today for full information.

THE CLEVELAND TRENCHER CO.
20100 St. Clair Ave. Cleveland, Ohio
Edward R. Bacon Co., Distributor
17th and Folsom Streets
San Francisco, Calif.

THE BABY DIGGER

Stockton Fire Brick Company

FIRE BRICK, INSULATING BRICK
HIGH TEMPERATURE CEMENT

High Grade Refractories
for

GENERATOR LININGS
CHECKERS
BOILER SETTINGS

OFFICE:
Russ Building,
San Francisco

WORKS:
Stockton,
California

ceives a commission on all sales coming from this district.

The campaigns were held simultaneously in the two cities because the newspapers overlap in circulation. Advertising appearing in one paper thus lost none of its effect among the readers in the other city. Much rivalry also existed between the two selling organizations, which lent to the effectiveness of the campaign and was productive of increased results.

Newspaper advertising announced the campaign and was carried several times each week throughout the period of the sale. Some of the advertising informed the women of the city that a Chef's Cook Book would be given them free at the office of the Oklahoma Natural. Some of it told of the food demonstrator who was operating at the company office. Other space was utilized in telling of the sales plan.

On the day that the campaign opened broadsides were given out in both cities by boy scouts working in each district under the direction of the salesman in charge of the district, and direct results were produced by this agency.

The usual terms of payment are 10 per cent down and the balance in 12 months. As an added inducement during the campaign, a five-dollar down payment and the balance in eighteen months were offered as terms.

Cooperation with the other appliance dealers in the city is a firm policy of the merchandising department. Prices on appliances will not be cut under those prevailing in the city, and the service department will service the other man's merchandise just as quickly and effectively as its own.

The salesman is paid a small salary with a commission. He not only gets experience in the field but also on the sales floor of the company. He usually spends one day each week on the sales floor, at which time he is able to take care of the appointments made with those who want to view the merchandise.

It is planned by the heads of the department to use the Tulsa and Oklahoma City offices as a training ground for salesmen. As new towns are opened up salesmen from these offices will be selected for higher positions at these places.

COAST COUNTIES BOOKLET TO PROSPECTIVE BUILDERS

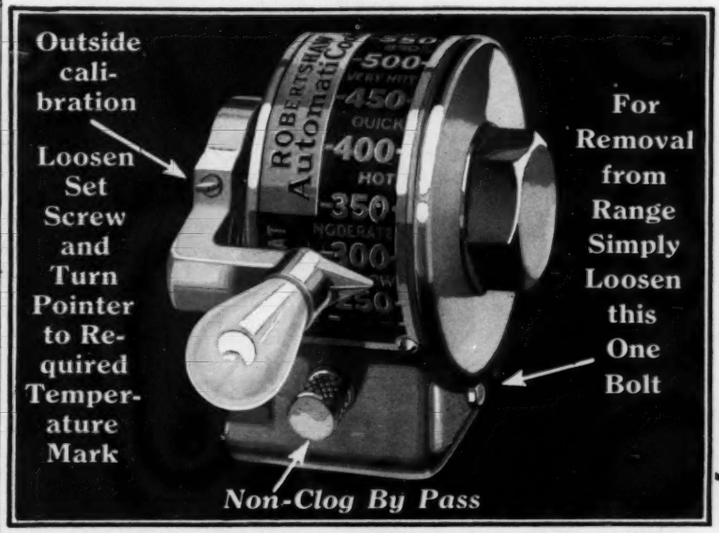
"Planning to Buy or Build " is the title of a little booklet which is being distributed by the Coast Counties Gas & Electric Company, Santa Cruz, Calif., to its consumers and others who are interested in acquiring or constructing a house.

Recognizing the fact that gas appliance sales depend in a large measure on the house having properly located vents and gas connections, the booklet leads with the caution: "Be sure to plan for gas." This keynote is followed by several pages of information on piping the house for gas, gas heating, the necessity of proper flues and their construction, and so on. The booklet is very attractively done in three colors and treated in somewhat the modern style of art.

SERVEL DISTRICT MGR. NAMED FOR MISSOURI, ILLINOIS

W. G. Wright has been appointed district manager for Servel Sales, Inc., covering the eastern part of Missouri and the southwestern portion of Illinois. Mr. Wright has been in the refrigeration business for some years, most recently with the Copeland compnay.

GAS COMPANIES and STOVE DEALERS



Appreciate the Exclusive Advantages of the "B" Type

ROBERTSHAW AutomatiCook

Outside Calibration. Takes just a few seconds to change the temperature setting if required, by means of a convenient set-screw on the temperature pointer. Merely loosen the set-screw, move the pointer to the proper temperature mark on the dial, and then tighten the set-screw.

Quick Removal. Should the "B" Type AutomatiCook become damaged for any reason, necessitating replacement, it can be removed without disconnecting the range or disturbing the linings or the piping. Requires no mechanical servicing or repairs on the job. Simply loosen one bolt, replace the Thermostat with a spare and tighten the bolt. The job can be done in less than a minute's time.

Non Clog By-Pass Pilot. Will not clog nor bind. Always moves freely and maintains its adjustment. Eliminates servicing, adjusted by turning either to the right or left.

Non-Corrosive Valve Seat. The AutomatiCook is now being equipped with a Raised Non-Corrosive Valve Seat which will resist the corrosive action of gas, eliminating any possible trouble from this source.

Write for 8-Page Folder, illustrating and describing the above advantageous features.

ROBERTSHAW THERMOSTAT CO.

Youngwood, Penna.

The Robertshaw AutomatiCook is now used on more than 80 leading makes of Gas Ranges

GAS or WATER Connections

whether screw thread or gasket, should be made up with KEY SPECIAL PIPE JOINT COMPOUND.

KEY SPECIAL PIPE JOINT COMPOUND is not a quick hardening cement, but a plastic lubricant and a filler that will seal the most obstinate joint with ease. It covers more surface than an equal volume of red or white lead, thereby reducing the cost. It is waterproof—and there is no waste.

Manufactured by

E. A. Key Co., Inc.

1431 Santa Fe Ave.
Los Angeles, Calif.

Distributors in all principal cities.

WRITE FOR FREE SAMPLE

INSTITUTE OF MANAGEMENT IS NEW L. A. G. AND E. UNIT

A new agency for executive training has been created by the Los Angeles Gas and Electric Corporation in its Institute of Management, composed of all company employees who have supervision over the work of others. The purpose of the Institute is the study of common problems of management through papers and discussion. An executive committee has general charge of the Institute's activities, the committee personnel being D. L. Scott, manager of public relations, chairman; H. L. Masser, vice-president and executive engineer; H. J. Kister, manager of construction; J. G. Rollow, electrical engineer; Frank Weiss, manager new business; O. L. Moore, manager customers department; W. R. Shettel, constructing engineer; E. R. Northmore, superintendent electric distribution; W. M. Henderson, superintendent gas distribution; Wm. Haeckel, electric distribution, minute secretary; C. F. Stanley, assistant to manager public relations, attendance secretary.

GENERAL ATTORNEY OF P. G. AND E. MEETS DEATH

Leo H. Susman, general attorney for the Pacific Gas and Electric Company, San Francisco, died late in December from an attack of acute indigestion. Mr. Susman 49 years of age at his death. He came to San Francisco as a boy from Tasmania, attended public schools in that city and was graduated in law from Stanford University in 1901. In 1904 he entered the legal department of the California Gas and Electric Corporation, predecessor to the P. G. and E. and advanced rapidly, holding the post of general attorney for the last six years.

TABULATION OF TYPICAL ANALYSES OF COMMERCIAL NATURAL GAS†

Components	Pittsburgh	Cleveland	Cincinnati	Columbus	Bartlesville	Kansas City	Fort Worth	Los Angeles	Little Rock	Monroe, Louisiana
Methane	84.7	80.5	79.8	80.4	92.4	84.1	51.5	77.5	96.7	94.69
"Ethane"*	13.7	18.2	19.5	18.1	3.1	5.7	10.2	16.0	....	2.80
Carbon Dioxide	....	....	....	....	1.4	0.8	....	6.5	1.0	2.2
Nitrogen	1.6	1.3	0.7	1.5	3.1	8.4	38.3	....	2.3	2.31
Calc. specific gravity (Air = 1)	.6277	.6483	.6522	.6487	.5961	.6193	.7621	.6955	.5738	.6103
Calc. net heating value B t u per cu. ft. at 60°F. and 30″ mercury	1096	1133	1149	1130	987	949	699	1064	975	1004

*"Ethane" includes all of the hydrocarbon content other than methane.

The data contained in this tabulation, with the exception of those relative to Monroe gas have been taken from Technical Papers Nos. 109 and 158 of the U. S. Bureau of Mines. The information regarding Monroe gas has been furnished by J. A. Bechtold, Secretary Standard Oil Company of Louisiana. In the tabulation given above no analytic data are submitted to show the water vapor content.

PHYSICAL PROPERTIES—HYDROCARBONS OF NATURAL GAS—PARAFFIN SERIES†

Names of Hydrocarbons	Methane	Ethane	Propane	Butane	Pentane	Hexane	Heptane	Octane
Molecular formulae	CH_4	C_2H_6	C_3H_8	C_4H_{10}	C_5H_{12}	C_6H_{14}	C_7H_{16}	C_8H_{18}
Molecular weights	16.03[5]	30.05[6]	44.06[5]	58.08[5]	72.10[5]	86.11[5]	100.13[5]	114.14[5]
State-Isolated at 60°F. and 30″ mercury	Gas[1]	Gas[1]	Gas[2]	Gas[1]	Liquid[1]	Liquid[1]	Liquid[1]	Liquid[1]
Boiling points °F.	—263.2[5]	—135.4[5]	—49.0[5]	33.1[5]	97.7[5]	156.2[5]	208.4[5]	257.9[5]
Melting points °F	—299.2[5]	—277.6[5]	—310.0[5]	—211.0[5]	—203.4[5]	—137.7[5]	—130.0[5]	—69.7[5]
Specific gravity—(Air=1) at 60°F.	.5546[1]	1.040[1]	1.525[6]	2.009[5]	2.494[5]	2.979[5]	3.462[5]	3.948[5]
Specific gravity—(Water —1) at 60°F. unless otherwise indicated	.4104[5]	.446[5]	.5355[5]	0.6000[1] at 32°F.	0.6258[5]	0.6624[5]	0.6874[5]	0.7063[5]
Cubic Feet at 60°F. and 30″ mercury,—dry— per pound avoirdupois	23.60[5]	12.59[5]	8.58[5]	6.515[5]	5.248[5]	4.394[5]	3.780[5]	3.316[5]
Pounds avoirdupois per U. S. gallon at 60°F. unless otherwise indicated	3.420[3]	3.716[6]	4.462[6]	4.998 at 32°F.	5.214[5]	5.519[5]	5.727[5]	5.885[5]
Cubic Feet of vapor at 60°F. and 30″ mercury —dry—in one U. S. gallon at 60°F.	80.6[3]	46.7[3]	38.2[3]	32.56[5]	27.36[5]	24.25[5]	21.65[5]	19.52[5]
B.t.u. per cubic foot, gross heating value—dry—at 60°F. and 30″ mercury	1009[5]	1764[5]	2519[5]	3274[5]	4029[5]	4784[5]	5540[5]	6295[5]
B.t.u. per pound, avoirdupois, gross heating value at 60°F.	23,818[5]	22,213[5]	21,614[5]	21,827[5]	21,145[5]	21,022[5]	20,942[5]	20,876[5]
Critical temperature °F.	—139.9[7]	93.2[7]	206.6[3]	303.4[3]	393.8[3]	454.1[3]	512.6	565.5[3]
Critical pressure—pounds absolute—per sq. in.	736.5[7]	739.5[7]	648.1[3]	552.4[3]	486.7[3]	441.9[3]	395.9[3]	371.2[3]
Specific heat at constant volume	0.449[5]	.....	.....	0.530[7]	0.512[3]	0.527[3]	0.504	0.505[3]
Specific heat at constant pressure	0.593[7]	0.506[8]	0.475[8]	0.458[8]	0.448[8]	0.442[8]	.....	.....
Ratio of specific heats	1.32[3]	1.2	1.15[3]	1.108[3]	.....	.....	.....	.....
Latent heat of vaporization—								
B.t.u. per pound	.....	213[8]	186[8]	170.8[8]	155[8]	143[8]	.....	.....
B.t.u. per gallon	.....	792[8]	830[8]	854[8]	808[8]	790[8]	.....	.....

[1]Beilstein's Organische Chemie
[2]Landolt's Tabellen
[3]U. S. Bureau of Standards Circular No. 57
[4]"Gasoline Industry" by G. A. Burrell
[5]Calculated
[6]Gas Chemists Hand Book
[7]Kaye and Laby—Physical and Chemical Constants
[8]Oil and Gas Journal by W. W. Odell

Note: In the calculations, the following equivalents were used:

1 pound avoirdupois.....453.59 grams[5]
1 U. S. gallon.....3.7853 liter
1 cubic foot.....38.317 liters
1 atmosphere.....14.73 pounds per square inch
Molecular weight, in pounds avoirdupois, of any gas or vapor will occupy a volume of 377.4 cubic feet at 60°F. and 30″ mercury—dry.
Beaume Modulus.....140

†Note: Data on physical and chemical characteristics of natural gas prepared by James B. Garner, Ph.D., Director of Research of the Hope and Affiliated Natural Gas Companies.

The CHEF will Listen!

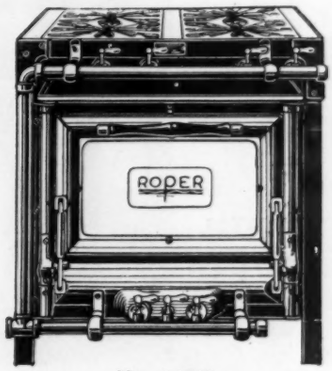
What the Chef says—GOES!
Nine times out of ten in a Hotel or Restaurant equipment sale...

The Chef will listen to the salesman who talks Roper. Imagine the bombardment of sales arguments built for the man who knows his kitchens:

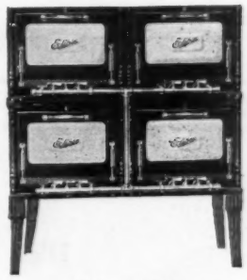
The most complete line manufactured for light and medium duty—the exact range for any conceivable requirement—all built in sections, each with any style top desired—start with one section, increase to a battery—food for 2,000 or a meal for four with the same economy on the same equipment—open, griddle, or broiler top on any section—economy in purchase price—economy in gas bills—durability—

And an ex-K. P. can clinch all arguments by pointing out that much of the Roper equipment was designed for and used originally in the army camps wherever gas was available. That meant about ten years of abuse in ten months of use. And the Roper's came through smiling.

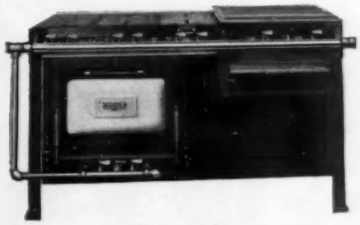
Some very convincing folders on the complete Roper line for Hotels and Restaurants will be mailed to your prospects if you will send in their names.



No. 24-41.
A Heavy Duty Hotel Range originally designed for Army use. For the hardest jobs.



No. 25-82.
Medium weight Hotel or Restaurant Range. Best adapted to small restaurant and cafe use.



No. 28-D.
A practical range for short order houses and small restaurants.
A popular many-duty piece of equipment.

GEO. D. ROPER CORPORATION
Rockford, Ill.

Pacific Coast Branch: 135 Bluxome St.
San Francisco, Calif.

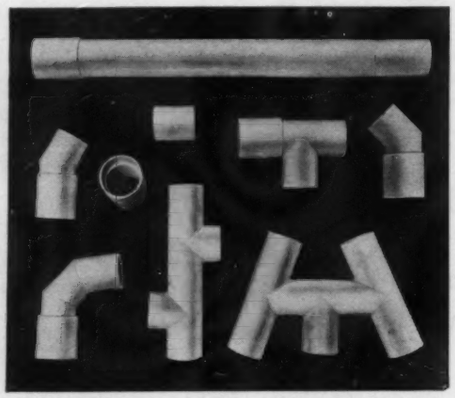
ROPER
TRADE MARK

GAS RANGES
GAS FURNACES

VITEX

Increases Draft

Improves Combustion



Absolutely Non-Corrosive

The Perfect Gas Vent and Flue Pipe

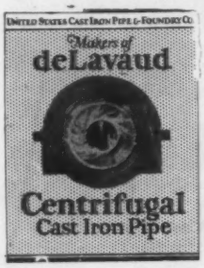
Samples, prices, and installation information gladly furnished on request

Manufactured by

Plant Rubber & Asbestos Works

537 Brannan Street, San Francisco, Cal.

Cast Iron Pipe and Fittings



for All Purposes

High and low pressure pipe for Gas Service

United States Cast Iron Pipe and Foundry Company

Sales Offices
San Francisco, Pittsburgh, Dallas, Kansas City, Cleveland, Philadelphia, Chicago, Birmingham, New York, Buffalo, Minneapolis

General Offices: Burlington, New Jersey

W P & S

DESIGNERS, FABRICATORS & ERECTORS OF PRODUCTS OF **STEEL**

Investigate WESTERN Hi-Pressure Unit Gas Holders

WESTERN PIPE & STEEL COMPANY OF CALIFORNIA

5717 Santa Fe Ave. LOS ANGELES — 444 Market Street SAN FRANCISCO

FACTORIES: LOS ANGELES · SOUTH SAN FRANCISCO · FRESNO · PHOENIX · TAFT

W P & S

Direct-by-Mail Effort Has Two-fold Appeal

(*Continued from Page 29*)

turns from the public-relations side. One district manager listed 37 prospects from the postcards returned to his office in the first few days, and says that 32 of these will be turned into range sales. Other district managers report satisfactory early sales and the listing of many new prospects.

The total cost of the experiment—including sketches, cuts, two-color printing, postage, etc., was $4,100. Sales which may be traced to this special campaign probably will exceed $30,000 before the returns are all tabulated, and the public-relations value of the mailing, as we view it, is considerably more than the sales value. Direct mail experts tell us that 2.8 and 2.5 per cent inquiries are considered very good—even after mailing a series of six separate pieces. Within the first two weeks, our customer-inquiries from this single mailing piece, had exceeded two per cent of the total mailing and this probably will be increased to three per cent or better when returns up to January 1st are recorded.

As the returns from this project are tabulated and classified they are studied by the executive officers of the company and used for purposes of discussion by a number of the Efficiency Clubs among the company's employed personnel. They supply material for fruitful discussion of the practical application of the company's policies, customer-response, and advertising technique.

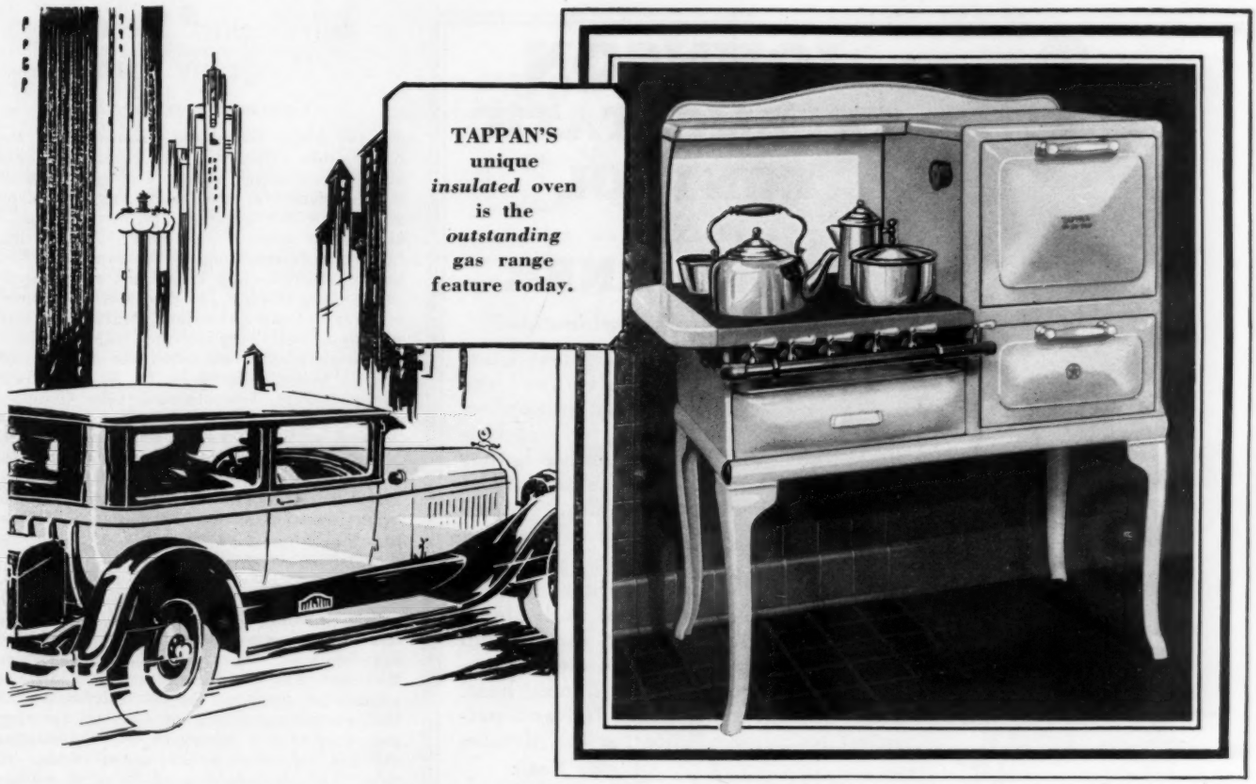
As one result of this experiment, the company already has decided upon at least two similar mailings to its domestic consumers during 1929. Their general set-up will be similar but fresh ideas in "copy" and in typographical arrangement will be used. In these subsequent mailings equal attention will be given to public-relations, customer-good-will, and to sales.

GAS COMPANY MEN REPAIR TOYS; SPREAD XMAS CHEER

Employees at the gas meter and carpenter shop of the San Diego Consolidated Gas and Electric Company performed unusual public service just before Christmas. Working after hours on their own time these men reconditions "crippled" Christmas toys for distribution to needy children in San Diego. The toys were gathered together in a campaign sponsored by the San Diego Sciots and the San Diego Sun.

SAN DIEGO CONSOL. G. & E. STOCK ISSUE REQUESTED

San Diego Consolidated Gas and Electric Company has applied to the Railroad Commission of California for authority to issue and sell $3,000,000 par value of its common capital stock.



The closed car.....*and the* INSULATED gas range

—*both are in key with the modern trend*

IT'S not so long since most folks drove open cars, and closed cars were the exception.

But times have changed. Today, people have learned the comfort of the closed car.

A similar change is taking place in gas ranges. Women are learning of the kitchen comfort that goes with oven insulation. The *insulated* range is rapidly coming into its own.

The Tappan In-So-Top Gas Range, insulated with rock wool, is playing an important part in bringing this change about.

The Tappan In-So-Top is making women more than ever "sold" on gas as the ideal cooking fuel. At the same time its kitchen-comfort appeal is inviting greater use of the gas range.

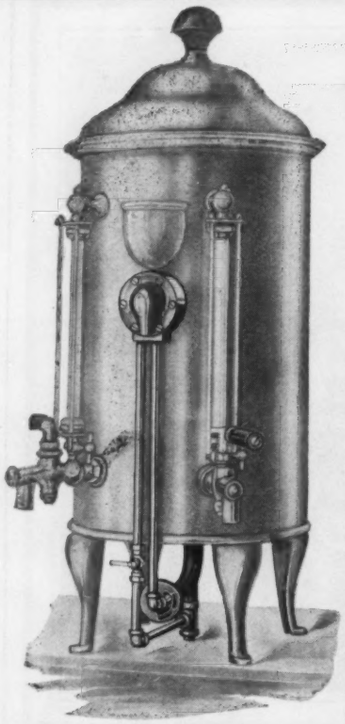
Write us for full particulars about the Tappan In-So-Top and our merchandising plans.

Tappan In-So-Top Ranges may also be had with color trims in attractive tints

THE TAPPAN STOVE COMPANY, Mansfield, Ohio
Pacific Coast Office, 665 Howard St., San Francisco

TAPPAN *In-So-Top* GAS RANGE

The Gas Range of *Tomorrow* Is Here *Today*



JOHNSON THERMOSTATIC CONTROL ...AND... URN BURNER

A great gas-saving combination!

The Johnson Thermostatic Heat Control is designed for use on Coffee Urns and Steam Tables. It may be applied quickly and easily to any type of Urn or Table. The result of its use is that coffee and foods are maintained at the proper constant temperature. Needless excessive gas consumption is avoided.

The New-Type Urn Burner is also designed for Coffee Urns and Steam Tables. It fits closely to the bottom of the unit to which it is applied, thereby utilizing maximum flame heat. Also embodies important Johnson patented features. Write for full details.

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

Pacific Coast Representative:
C. B. Babcock Co.
135 Bluxome Street
San Francisco, Calif.

PATENTED

Martin Unit Gas Furnaces

ARE THE RESULT OF 38 YEARS HEATING EXPERIENCE
MADE IN FOUR SIZES
Electric, Thermostat or Manual Control
Approved by A. G. A. Laboratory and by the City of Los Angeles
Write for your copy of "Modern Heating Methods"

PHILLIPS HEATING, VENTILATING & MFG. CO.
1710 W. Washington St.
Los Angeles, California

Live Agents Wanted

TESTING LABORATORY A.G.A. APPROVED

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

Shreveport Meeting Program Plans

(*Continued from Page 19*)

get far away from field, transmission, and distribution difficulties and enter the realm of the accounting house. The committee of the American Gas Association has just started a study of this question and our convention expects to take it up under the heading "Proper Classification of Accounts for Natural Gas Producing, Pipe Line, and Distributing Companies." Joe Zeppa of Shreveport, secretary of the Arkansas Natural Gas Corporation, will prepare this paper. He is gathering ideas from others in the industry and is being assisted by H. M. Brundage, vice-president, Consolidated Gas Company of New York, and chairman of the committee on uniform classification of accounts of the American Gas Association. Mr. Zeppa has a thorough grasp of this important subject and I should like to see a thorough discussion of the question among the delegates, following Mr. Zeppa's paper.

SALES

Selling our product, after all, is the final test of our success and the ultimate goal of our business. Such an important element therefore has not been overlooked in preparing the program for this convention. At the special suggestion of Col. Oscar Fogg, president of the American Gas Association, we are taking this subject up under the title "The Development of Sales of Natural Gas and the Rates Necessary to Obtain Business". This paper has been prepared by Harold Meade of the New Orleans Public Service, Inc., which has just come in to natural gas service, New Orleans having been connected with the fields of northern Louisiana this fall, after being served with manufactured gas for almost a century. We look forward with great interest to this discussion on the ideal rates necessary for obtaining business.

ADVERTISING

In Dallas we have had gratifying success with a unique type of gas company advertising which was originated by Miss Lois Upshaw, advertising expert of the Dallas Gas Company. I shall not attempt in this article to divulge what Miss Upshaw has in store for us but if it is as interesting as her advertisements I can predict that her address will be one of the bright spots of the program.

Open flow by pressure methods will have a place on the program, but whether it will be a formal paper or an informal discussion has not yet been settled. Mr. Rawlins probably will lead this discussion. Walter Reid, consulting engineer of Dallas, who is also well equipped for this task probably will contribute to the discussion.

The tremendous natural gas evolution in the Southwest in recent years demands a place on our program and we are planning an address to cover the highpoints of this development.

I have already mentioned the meeting of the Louisiana Section of the American Society of Mechanical Engineers. We expect to join with them for two numbers of the program. One of them is Mr. Biddison's paper, already mentioned, and the other will be a moving picture on the manufacture of seamless line pipe. Some portions of the program will be left open for questions and general discussion. Our Shreveport hosts have arranged entertainment which while

highly suitable will not interfere with the strictly business features of our meeting. There probably will be a noon day luncheon on Monday, January 14, and a barbecue and theatre entertainment on Monday night. B. A. Hardy of Shreveport, representing the Moody-Seagraves interests, has expressed the desire to invite the delegates to a barbecue at the Waskom compressor station of his company 23 miles from Shreveport. We are attempting to give this generous offer a place on the program of entertainment.

I have attempted to give only the outstanding elements of our meeting to suggest its general nature.

The problems of the industry in the Southwest are universal throughout the section, applying to no one company and no single district, but to all alike. We expect to include in this meeting the states of Oklahoma, Texas, Louisiana, Arkansas, and New Mexico, constituting a section which in a very brief time has come into world leadership in natural gas production and we hope to make our meeting of interest to delegates from everyone of these states.

N. C. McGowen of Shreveport, former chairman of the Natural Gas Department and at present a member of the Advisory Board of the Department, has taken a leading part in developing the meeting and is in charge of arrangements at the Shreveport end.

Elmer E. Schmidt of the Lone Star Gas Company, Dallas, has given much valuable time and hard work to the building of the program and its success will rest partly with him.

Among items not mentioned in the program proper, but which may be given attention are: gas refrigeration, rate structures, the American Gas Association laboratory, removal of dust from mains and services, possible competition of electric water heaters, and means for extending the domestic cooking load.

GAS IN LOUISIANA

Delegates will find a great deal to interest them in and around Shreveport. Louisiana has now surpassed West Virginia, one of the pioneer natural gas producing states, in gas production. The developments about Shreveport and Monroe are replete with interesting events. From the moment when natural gas was first piped to Shreveport through a 6-inch line from the nearby Caddo Oil Field district in 1906 to the present the industry's growth in Louisiana has constituted a natural gas epic. The visitors may find interest in frequenting some of these great gas fields which are providing fuel to now warm the homes, cook the food, and operate the industries of many states.

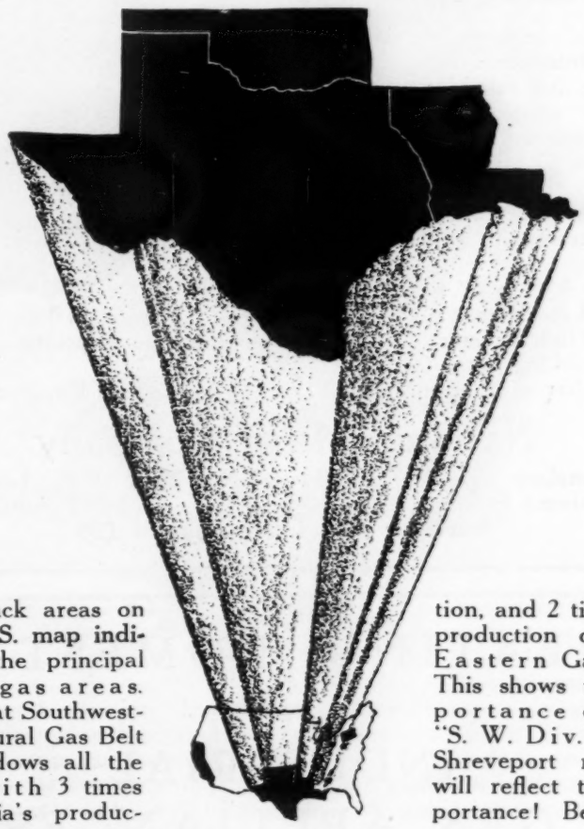
All natural gas men in the Southwest who can leave their business during this very busy period are urged to join us in this meeting which, above all, will be a business conference in which we will attempt to aid in the solution of our many pressing problems. The gas men will meet many old friends at Shreveport and the meeting will afford an opportunity for renewing acquaintanceships. This will result in knitting the industry in the Southwest closer together so that we can present a united front both in trouble and in prosperity. Let us start the year 1929 right by attending this meeting!

INDUSTRIAL FRANCHISE GIVEN IN KANSAS CITY, MO.

The Missouri State Public Service Commission, in a decision made on December 1 authorized the Industrial Gas Company to distribute industrial gas in Kansas City. The application has been pending before the Commission for the past eight months.

GREETINGS TO "S. W. DIV."

NATURAL GAS DEPARTMENT OF AMERICAN GAS ASSOCIATION WE'LL SEE YOU AT SHREVEPORT, JAN. 14-15!



The black areas on this U. S. map indicate the principal natural gas areas. The great Southwestern Natural Gas Belt overshadows all the rest, with 3 times California's production, and 2 times the production of the Eastern Gas Belt. This shows the importance of the "S. W. Div." The Shreveport meeting will reflect this importance! Be there.

LONE STAR GAS CO.

DALLAS

Duro Low Pressure Gas Burner

Patented in U.S.A.

The Duro Low Pressure Gas Burner is the culmination of many days of research, numerous combustion tests and practical trials in the drilling field, and in industries.

Duro flue gas analysis tests show CO_2 contents running from 10.5 to 11.5 per cent. Uses minimum gas volume. Simple to install.

Write Us for Information

DURO GAS BURNER, Inc.
228 Atco Bldg. TULSA, OKLA.

Empire Oil Meters

Positive Displacement Oscillating Piston Type

Simple in construction, with low cost of maintenance.
Accurate and reliable.
Specially adapted for Cracking and Absorption Processes.
For Gas Companies — Refiners and Distributors of Gasoline and all distillates of petroleum.
For measurement of Crude oils, cold or hot.
Sizes for ½" to 6" pipes.
Standard stock meters for working pressures up to 150 lbs.
Special High Pressure Meters according to specifications up to 600 lbs. working pressure.
Made either with large Vertical Dials or Horizontal Registers.

National Meter Company

San Francisco 1048 Folsom Street — **299 Broadway—New York** — **Los Angeles** 643-645 Santa Fe Ave.

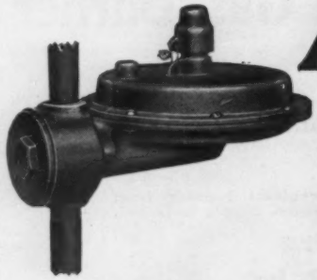
Send for Descriptive Bulletin 110

HEATING--DOMESTIC
and
INDUSTRIAL
GAS APPLIANCES

C. B. Babcock Company

135 Bluxome Street, San Francisco — 2118 Atlantic Street, Los Angeles

MODEL 10 SERIES
With or Without Mercury Seal



Spring Type
Also furnished in Dead Weight Type

Reynolds Gas Control Since 1892

Products for all kinds of Pressure Reduction—for either artificial or natural gas.

GOVERNORS — Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.

REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.

REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana

P. G. *and* E. Plans *for* 1929 Sales in Dept. Meeting

By Elliott Taylor

San Francisco Manager, Western Gas

ANOTHER million dollar sales budget for the Pacific Gas and Electric Co., San Francisco, has received the stamp of approval of President A. F. Hockenbeamer, and 1929 will see an increase in every department of those activities which were started and conducted so successfully during the year just closed.

The year 1928 may have been an experiment in some of the phases of gas merchandising, but the reports rendered at the first annual sales convention of the company indicated that, without exception, every sales activity started last year was eminently successful.

Before what was in all probability the largest sales department meeting ever held by a western utility, even more ambitious plans for 1929 were announced in their general aspects. Sales department employees, division managers and officials from all sections of the company's northern California system were all present, and slightly less than 600 men and women employees sat down to the banquet served in the Palace Hotel, San Francisco, on the night of Friday, December 21st.

The banquet was memorable for its excellent menu and for a program of entertainment that was in every way worthy of professional talent, put on under the able leadership of Frank Bevan of the San Francisco offices. Space limitations preclude mention being made of the dozen or more individuals who entertained, and of the splendid chorus.

R. E. Fisher, vice-president in charge of public relations and sales, took charge of the meeting following the program. He reviewed the year just closing and then called upon sales department executives for detailed information of past and present activities.

A brief recapitulation of the 1928 activities was presented by H. M. Crawford, general sales manager. Of the budget allotted ($982,000) only $800,000 was expended, due in a large measure to the fact that the campaign was not approved until late in January, and a new sales force had to be recruited and trained. Despite this handicap, however, the sales quota of $4,460,000 was exceeded for a grand total of 107 per cent.

The sale of gas increased 760,000 M.c.f. over the previous year, for an increase in revenue of $960,000. Similar increases were noted in the electrical department.

Vice-presidents W. S. Yard and P. M. Downing, in charge of construction and operations of the gas and electrical departments, respectively, spoke briefly on the plant capacity available to carry the increased load projected for 1929. Both said in effect that whatever load was sold, their departments would pledge to fill the demand. Mr. Yard was particularly optimistic, saying that a 50 per cent capacity increase could be met if necessary.

Bonuses in the amount of $9,000 were paid in 1928 to employees not salesmen, for live prospects turned in by them and subsequently sold by company representatives. For this bonus fund in 1929, $10,000 has been set aside.

Charles Jordan's advertising department will have some $165,000 to spend during the coming year on newspaper space, envelope enclosures, special booklets and literature

and other sales helps of a like nature. Approximately 40 per cent of this will be on gas sales and gas appliance sales activities.

Salesmen's commissions alone will total approximately $440,000.

Industrial gas sales will be pushed by a sales force of 18 men with a goal set of $350,000 in additional revenue.

Translating 1929 plans into terms of actual shipments by freight, Mr. Crawford pointed out that 20 carloads of gas-fired furnaces and boilers will be sold; 8 carloads of radiant type heaters; 35 carloads of automatic gas water heaters and 44 carloads of gas ranges.

All of these proposed activities were then turned over to Vice President and General Manager F. A. Leach. He in turn handed them to President A. F. Hockenbeamer with his recommendation for their approval in toto. Mr. Hockenbeamer spoke briefly on the spirit of coordinated effort that would assure the success of all that was to be undertaken and affirmed his official approval of the campaign.

Then, amid an enthusiastic demonstration that augurs well for the increase in both gas and electric consumption for 1929, the meeting adjourned.

OFFER COOPERATION TO BUILD GAS CONSUMPTION IN VENTURA

Heads of industrial concerns, presidents of local chambers of commerce, public officials and newspaper editors from all sections of Ventura County met at the Pierpont Beach and Country Club, near Ventura, on December 18th, to discuss with F. S. Wade, president, and other officials of Southern Counties Gas Company the new rate decision for Ventura County effective December 20th, by order of the State Railroad Commission. They listened to a statement by the gas company president, who said that while the company had filed an informal protest with the commission on the rate base of seven per cent capital return, no move to defer the effect of the commission's ruling is contemplated. Replying to Mr. Wade's explanation, several expressions were made by Ventura County business leaders and representatives of the newspapers, offering cooperation in building up increased gas consumption under the new rate.

B. C. ELECTRIC RY. DIRECTOR ON PERSONAL VISIT

Sir Herbert Holt, one of the new directors of the B. C. Electric Railway Company, last month visited some of the company's holdings at Vancouver and Victoria.

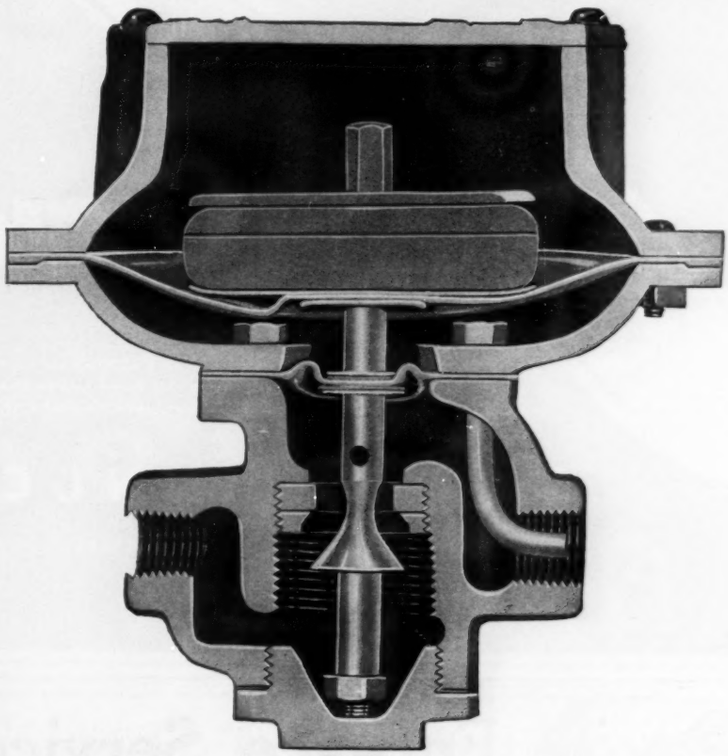
MAIN CONSTRUCTION PROCEEDS APACE IN VANCOUVER

The B. C. Electric Railway Company has just received delivery of ten miles of steel pipe which will be utilized in the laying of gas mains. All the pipes are of seamless steel and when laid will be welded at the joints. There are 383 miles of gas mains in the territory served by the company on the lower mainland.

R. H. TIMMONS MEETS END THROUGH DROWNING

Colonel R. H. Timmons of Wichita, Kansas, met death through drowning late in November in a boat accident on the lake of the Kansas Gas and Electric Company power plant at Service, Kansas. Mr. Timmons was assistant to L. W. Ripley, vice-president and general manager of the Kansas Gas and Electric Company, and took a prominent part in gas association work in this section.

Reliance Low Pressure or Appliance Regulator



TYPE "A"

This type of regulator is designed for use directly on a gas supply to the appliance or for governing entire house supply up to the limits of inlet pressure and capacity.

Remarkable for its ability to maintain pressures under great demand. Capacity 50% to 100% greater than any other regulator on the market.

Built in sizes 3/8", 1/2", 3/4", and 1".

Reliance Manufacturing Company

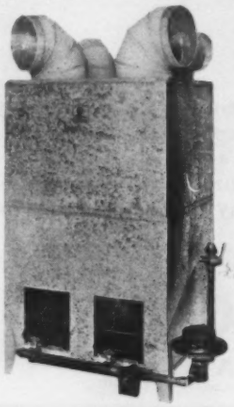
ALHAMBRA, CALIFORNIA

Mettler Entrained Combustion Gas Burners

FOR ALL Purposes Kinds of gas Pressures

406 S. Main St. **LEE B. METTLER CO.** Los Angeles Cal.

FIRE BRICK
LININGS, CHECKERS and BOILER SETTINGS are carried in stock for quick shipment. If special or hand-made shapes are required, our plant is especially equipped to make them.
GLADDING, Mc BEAN & CO.
SAN FRANCISCO
LOS ANGELES
PORTLAND
SEATTLE
421



Furnace Service

How much of your overhead is represented by unnecessary trips to your job?

In other words does your furnace or your service man render your service?

Install **Perfection Multiple Unit Furnaces** and cut down on your overhead.

L. H. Freymuth Jr

311 East Pico St., Los Angeles

The War Department, after a two year test, has purchased 140 No. 1 and No. 2 Electrogas Floor Furnaces for the San Francisco Presidio.

quality ELECTROGAS FURNACE CO. SAN FRANCISCO economy

WESTERN PUBLIC SERVICE CORP. BUYS UTAH COMPANIES

FOLLOWING organization of the Western Public Service Corporation to develop the natural gas project in Utah, announcement has been made of the purchase of the Utah Gas & Coke Company and the Ogden Gas Company by the newly formed corporation, operating under the laws of Delaware.

The project of bringing natural gas from Baxter Basin, Wyoming, to Utah calls for a producing organization, a pipe line and transportation organization, and a distribution organization. Each one of these is controlled by the holding company—the Western Public Service Corporation.

Officers of the new company are: Chairman of the board, George W. Crawford, who is chairman of the board of the Columbia Gas & Electric Corporation; president, O. D. Donnell, who is president of the Ohio Oil Company; vice-presidents, R. J. Berry, who is vice-president of the Ohio Oil Company; N. K. Moody, president of the Prairie Oil & Gas Company; T. B. Gregory, vice-president of the Columbia Gas & Electric Corporation, and L. B. Denning, president of the Lone Star Gas Company; secretary, D. E. Mitchell; treasurer, T. B. Gregory; assistant secretary and assistant treasurer, F. B. Firmin; assistant secretary, E. B. Redpath.

John T. McFadyen, vice-president of the Ohio Oil Company and one of the franchise applicants, will be in charge of the gas production at the fields, and John Fertig, vice-president of the Producers & Refiners Corporation, a subsidiary of the Prairie Oil & Gas Company, will be in charge of pipe line operations.

A. V. BOURQUE RESIGNS AS NATURAL GASOLINE HEAD

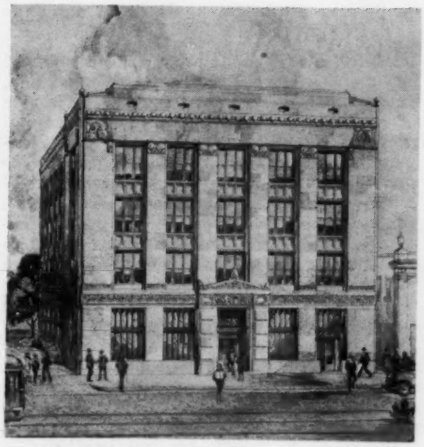
A. V. Bourque, secretary and treasurer of the Natural Gasoline Association of America, resigned that post on November 23 to accept a position with the Western Petroleum Refiners Association as assistant to the executive manager. He is succeeded by Ray E. Miller in the office of secretary-treasurer of the Natural Gasoline Association. Mr. Bourque became secretary of the natural gasoline group in 1921, and since that time the program of the association has broadened measurably.

Much of Mr. Miller's previous experience lies in the field of safety work. In 1920 he became manager of the safety department for the Marland Oil Company, and during a two-year leave of absence from the Marland organization granted in 1925 he was safety director for the Mid-Continent Oil and Gas Association. In 1928 he again served as active head of the Marland safety organization. He was graduated from the University of Missouri in 1916.

Headquarters of the Natural Gasoline Association of America are in the Tulsa Building at Tulsa, Oklahoma, where Mr. Miller will be located.

SECOND LOOP LINE AROUND SAN ANTONIO BEGUN

Increased consumption of gas for domestic purposes is making necessary construction on a second loop line around the city of San Antonio, Texas. This second loop will be built in sections as increased supply of gas becomes necessary at various points in the city. Sixteen-inch steel pipe in 40-foot lengths is being used for the line and an anti-corrosion coating is being applied before laying.



Artist's sketch of Fort Worth Gas Company's proposed office structure.

Fort Worth Gas Company *to* Erect New Offices

THE Fort Worth Gas Company has announced plans for the erection of a four-story office building to be located on Monroe Street across from the post office in that city. The building will be four stories in height, but will be constructed on a foundation which can eventually carry 10 stories. The cost will be aproximately $300,000, which includes the cost of the land. Actual construction of the building will be begun in January, and it will require about five months for completion.

On the first floor will be cashier cages, cages for application clerks, service counter and other departments with which the general public comes in contact. There will be ample space for the display of gas appliances. On the outside of the building there will be facilities for parking customers' automobiles while they are paying bills or transacting other business.

Officials of the company will have offices on the second floor, which will also accommodate the general book-keeping department, customers' ledgers accounts, purchasing department, separate rooms for bookkeeping and addressograph machines, telephone switchboard, collections and credit department.

Engineers, superintendent of distribution, chart department, drafting department, industrial engineer and the advertising department, will be located on the third floor. The fourth floor will be arranged for other company activity.

The exterior of the building will be of white cut stone. Fireproof construction will be employed throughout. A basement large enough to care for a central gas heating plant is being planned.

O. K. Shannon is president of the Fort Worth Gas Company, and Henry C. Morris, president of the Dallas Gas Company, is operating vice-president.

SEPARATE SERVEL SALES AND ADVERTISING

Announcement has been made by H. W. Foulds, vice-president of distribution for Servel Sales, Inc. of the division of the advertising and sales promotion activities.

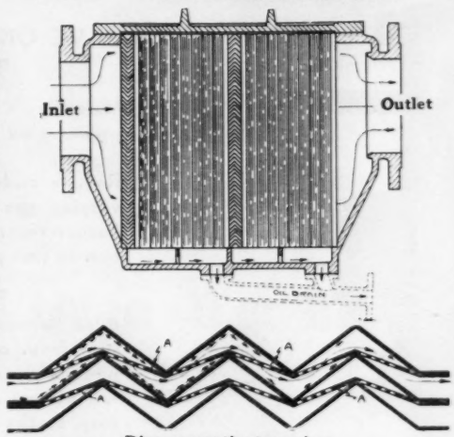
Advertising activities will be under direct charge of William H. Reynolds, advertising manager with headquarters at 51 E. 42nd Street, New York City, while sales promotion activities will be directed by A. T. Golding with headquarters at Evansville, Ind.

Install

PIONEER SEPARATORS

For Removal of All DIRT AND MOISTURE From GAS TRANSMISSION Lines

The 10 in. size has 56 separated vertical streams which pass over enormous and effective baffle surfaces, ensuring 100% purification of each and every stream—independent of the adjacent streams.



The 10 in. size has 1680 separate catch pockets with vertical drains, and the Gas Stream changes its direction of travel, velocity and shape 8400 times.

Diagrammatic top view

of Pioneer Separator showing principle. The thin, long arrows indicate the flow of the steam, air, gas, etc. The heavy short arrows show the flow of extracted impurities. Letter A indicates catch pockets.

PIONEER EQUIPMENT CORPORATION OF AMERICA

231 BROADWAY NEW YORK

General Representative for California

H. PLUMMER, 806 FIFE BUILDING SAN FRANCISCO

Fire Brick Contractors

Established 1906

J. T. Thorpe & Son

Inc.

Specializing in Gas Generator, Boiler, Still and Furnace Brick, Industrial Furnaces, Retorts, Kilns, Brick Smokestacks.

A capable Engineering Department competent to advise on any problem involving firebrick construction.

San Francisco	Seattle	Portland	Los Angeles
417 Market St.	305 White Bldg.	609 Ry. Exch. Bldg.	321 W. 3rd St.

HOT-N-KOLD

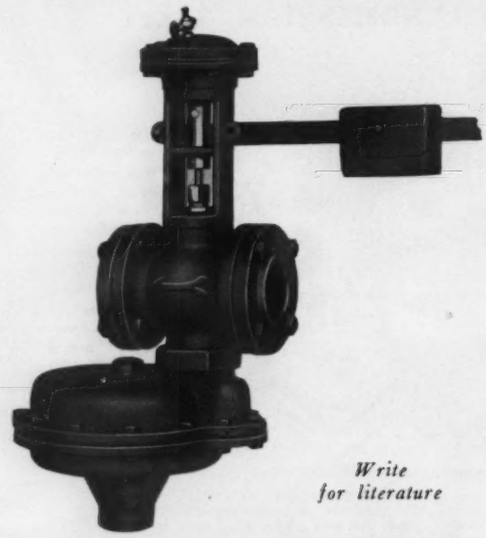
The Hot-N-Kold Shops are now serving the public in eight cities in the northern part of California with Kelvinator Refrigeration, Holbrook Ranges, Welsbach Water Heaters, and other major appliances.

A valuable business franchise awaits the right dealer in every town.

HOT-N-KOLD CORPORATION

949 Mission Street San Francisco, California

GILFILLAN
Dual Control Valve Regulators



SAVE ONE INSTALLATION

Maintain a constant steam pressure on the boiler
and
Reduce and maintain an unvarying gas pressure to the burner regardless of the variation in line pressure.

Built to control Boiler pressure from one pound to 200 pounds steam, and deliver as low as two ounces gas pressure at the burner.

Write for literature

GILFILLAN MACHINE WORKS, Inc.
Ebenezer, Erie Co., N. Y.

Representatives
Jensen Instrument Co., 624 E. Fourth St., Los Angeles, Calif.
Gas Appliance Service Corp, 2014 Bryan St., Dallas, Texas.
The Diamond Supply Co., Charleston, W. Va.

The Magic Way Company

Gas Heating Devices

including

"Magic Way" Gas Furnaces
"Magic Way" Control Valves and Switches
"Potter" Radiators
"Steel Made" Radiators
"Cole" Floor and Wall Heaters
"Hall" Floor Furnaces

Manufactured by

Magic Way Company
National City · San Diego · California

SEVEN PER CENT RETURN SET IN VENTURA RATE RULING

A decision handed down on December 5 by the California Railroad Commission, under which the Commission ruled for a rate of return of 7 per cent per annum on capital invested by the Southern Counties Gas Company in natural gas service facilities in Ventura City and County, will be the subject of wide interest in utility circles. As its reason for departure from long established precedent recognizing 7½ or 8 per cent return as reasonable, the Commission assigned a "marked decline in the cost of money" during the last few years, holding that it would be possible for the utility to obtain needed capital at the lower rate of return. New rates are fixed in the decision, estimated to bring a reduction of approximately $50,000 in revenue from the area served. A service charge of 90 cents per meter per month in addition to the commodity rate has been instituted which will bring a slight increase in gas bills to small users. This "two-part rate" replaces the minimum form rate applied in the past.

A commodity rate of 70 cents per thousand cubic feet plus the service charge of 90 cents per meter per month was fixed for general domestic and commercial use in Ventura City and County excepting in sparsely settled territory in the Ojai and Camarillo districts, where the service charge was retained at $1.25 and commodity rates at 13 cents per hundred for the first two thousand cubic feet, 10 cents per hundred for the next six thousand cubic feet and seven cents per hundred for all over eight thousand cubic feet.

The new rates became effective on meter readings of December 20 and thereafter.

BABCOCK COMPANY DISTRIBUTES ROPER SALES MEMO BOOK

C. B. Babcock Company is distributing copies of the Roper Sales Data and Memo Book, prepared and copyrighted for 1928 by the Geo. D. Roper Corporation, to its clients. Valuable sales information concerning lines of Roper-made gas appliances are included in the 48-page pocket-size handbook. Typical sales canvasses and demonstration, together with charts for record of sales made during the year, are also included. Copies of the Memo Book may be obtained from the Roper Corporation or from the C. B. Babcock Company, Pacific Coast representatives.

KELSO, WASH., LETS FRANCHISE TO SEATTLE INTERESTS

Charles R. Collins, representing Seattle interests, was accorded a 50-year right to build and operate a gas plant in Kelso, Washington, by the city council, by vote on December 11. Construction on the system must start within six months and be completed in 18 months.

66 SO. COUNTIES EMPLOYEES ON SALES COURSE ROSTER

Sixty-six of the Southern Counties Gas Company's staff in southern California, including a number of the district managers, are taking the sales course offered through the American Gas Association.

FLIGHT LOADER ADDED TO COKE DEPT. EQUIPMENT AT VANCOUVER

The coke section of the British Columbia Electric Railway Company's gas department has purchased a new flight loader having a speed capacity for handling one ton per minute.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge.

HELP WANTED—MALE

Men interested in South American Work with large oil, mining companies who pay fare and expenses, write for our warranted service offer. South American Service Bureau, 14600 Alma, Detroit, Michigan.

Industrial and heating engineer. Midwestern natural gas company just opening new territory in Black Hills, South Dakota, desires technically trained man about 35 years of age with experience in heating and in application of gas to industrial processes and plants to develop industrial, commercial and heating sales. A-18, care of *Western Gas*, 124 West Fourth Street, Los Angeles, Calif.

House heating engineer. Midwestern natural gas company just opening new territory in Black Hills, South Dakota, desires technically trained man about 35 years of age with house heating experience to check and service existing furnace installations and to develop and organize such inspection in other towns now served. A-19, care of *Western Gas*, 124 West Fourth Street, Los Angeles, Calif.

ERNSBERGER RESIGNS FROM SOUTHWESTERN LIGHT AND POWER

Earl R. Ernsberger, president and general manager of the Southwestern Light and Power Company, Oklahoma City, Oklahoma, has announced his resignation, effective January 1. Personal interests, Mr. Ernsberger explained, demand an increasing share of his time, making his resignation necessary.

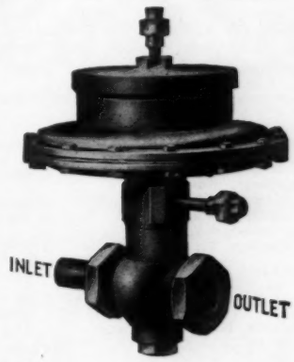
Mr. Ernsberger came to Oklahoma City from Charles City, Iowa, in 1922 and assembled several small utility companies serving seven cities in southwestern Oklahoma. Subsequent expansion brought the services of the Southwestern Light and Power Company in one form or another to almost every major city in this section of the state.

ELECTION TO DECIDE NATURAL GAS PROPOSAL IN LA JUNTA

Citizens of La Junta, Colorado, are to vote on January 8 on a proposal to grant a franchise to the Public Utilities Consolidated Corporation to provide the community with natural gas.

P. G. AND E. GIVEN PERMIT TO SERVE BELVEDERE

Pacific Gas and Electric Company, San Francisco, has been authorized by the Railroad Commission to exercise a franchise granted by the town of Belvedere, Marin County, Calif., for the distribution of gas.



Fulton Dead Weight Governor

An unusually sensitive, frictionless and long-lasting governor to be used either as a direct governor, or for individual service. Maintains a uniform pressure throughout the entire range of flow.

WRITE for the Chaplin-Fulton 60-page catalog. It's free and contains data on our many time-tested and proven gas regulators that you will find invaluable in your work.

The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes From 1 Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

28-40 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES:

WESTCOTT & GREIS, Inc.
Sales and Service
Dallas — Los Angeles — Tulsa

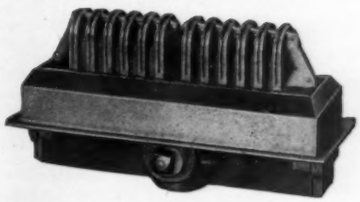
JNO. W. CRAWFORD
Sales Engineer
1855 Industrial Street Los Angeles

R. M. C. Gas Burner

If you had a monthly fuel bill of $300 and found it could be cut down to $200, would you be interested?

R. M. C. GAS BURNERS installed in R. M. C. RADIANT TILE have done this.

Let us tell you about them.



Rotary Manufacturing Co.

5720 Long Beach Avenue **Los Angeles, California**

A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Baker Iron Works.
Chaplin-Fulton Mfg. Co.
Jensen Instrument Co.
The E. A. Key Company
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
Western Pipe & Steel Co.

Adjustable Plugs
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
Hill, Hubbell & Co.

Analyzers
Fort Worth Laboratories.
Smith-Emery Co.

Apparatus, Experimental Gas
The Bartlett Hayward Co.
Pacific Meter Works.

Appraisals and Valuations
Charles R. Collins.
Smith-Emery Co.
United Engineers & Constructors, Inc.

Bags, Gas Main
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Barometers
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blocks and Tiles, Fire Clay
Gladding, McBean & Co.
Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.
Connersville Blower Co.
The P. H. & F. M. Roots Co.
United Engineers & Constructors, Inc.

Boiler Controls
The Cleveland Heater Co.
Gilfillan Machine Works, Inc.

Boiler—Brickwork
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
American Radiator Co.
C. B. Babcock Co.
Baker Iron Works.
Leahy Mfg. Co.

Boiler Settings, Pipe and Boiler Insulation
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.
The Bartlett Hayward Co.
Phillips Heating, Ventilating & Mfg. Co.
United Engineers & Constructors, Inc.

Boilers, Water Tube
Baker Iron Works.
Western Pipe & Steel Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Gladding, McBean & Co.
Stockton Fire Brick Co.
United Engineers & Constructors, Inc.

Brick, Firebrick—Installation
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
United Engineers & Constructors, Inc.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Leahy Mfg. Co.
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B. Babcock Co.
The Bartlett Hayward Co.
Duro Gas Burner Company.
L. H. Freymuth
General Gas Light Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Lee B. Mettler.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
Rotary Manufacturing Co.
Western Pipe & Steel Co.

Burners—Oil
Leahy Mfg. Co.
Rotary Manufacturing Co.

By-Product Recovery Apparatus
The Bartlett Hayward Co.

Calorimeter Accessories
Fort Worth Laboratories.
Pacific Meter Works.
United Engineers & Constructors, Inc.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
The Bristol Company
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Cement
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
The Bartlett Hayward Co.

Checker Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
Fort Worth Laboratories.
Pacific Meter Works.
Stauffer Chemical Co.
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Chemists, Analytical
Fort Worth Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
S. R. Dresser Mfg. Co.
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
The Bartlett Hayward Co.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.

Compressors, Air
Ingersoll-Rand Co.
Leahy Mfg. Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
Baker Iron Works.
The Bartlett Hayward Co.
Ingersoll-Rand Co.

Condenser Boxes
Baker Iron Works.

Controllers
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Robertshaw Thermostat Co.

Controls, Air and Steam
The Bartlett Hayward Co.
The Bristol Company
The Foxboro Co., Inc.
Jensen Instrument Co.

Cooling Systems
The Bartlett Hayward Co.

Cooling Towers
J. B. Gill Corporation.

Counters, Revolution
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.

Couplings
S. R. Dresser Mfg. Co.
The Bartlett Hayward Co.

Couplings—Flexible Rope & Spider Arm
The P. H. & F. M. Roots Co.

Coverings (Flat and Corrugated)
L. H. Freymuth

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressors
The C. & G. Cooper Co.

Danger Signals
Safety Gas Main Stopper Co.

Dephlegmaters
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc.)
The Bartlett Hayward Co.

Door, Clean-out
Baker Iron Works.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

Elevators
Baker Iron Works.

Engineers and Engineering Service
Charles R. Collins.
J. B. Gill Corporation.
The Bartlett Hayward Co.
Smith-Emery Co.
United Engineers & Constructors, Inc.
Western Pipe & Steel Co.

Engines, Diesel
The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.
United Engineers & Constructors, Inc.

Engines, Oil
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Steam
Ingersoll-Rand Co.

Evaporating Apparatus
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Excavators, Ditch and Trench
The Cleveland Trencher Co.

Exchangers, Heat
Baker Iron Works.
Western Pipe & Steel Co.

Exhausters
Connersville Blower Co.
Ingersoll-Rand Co.
United Engineers & Constructors, Inc.
United States Cast Iron Pipe and Foundry Co.
The P. H. & F. M. Roots Co.

Experimental Apparatus
The Bartlett Hayward Co.
Pacific Meter Works.

Filters
United States Cast Iron Pipe and Foundry Co.

Fire Clay and Products
Gladding, McBean & Co.
Stockton Fire Brick Co.

Fire Brick Contractors
J. T. Thorpe & Son, Inc.
Stockton Fire Brick Co.

Fittings
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Fixtures, Lighting (Domes, Portables, etc.)
C. B. Babcock Co.
Welsbach Company.

Fire Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Flanges
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Forgings
Baker Iron Works.
Payne Furnace & Supply Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

Furnaces, Floor
Electrogas Furnace Co.
Magic Way Company
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

Furnaces, Heating
The Estate Stove Co.
L. H. Freymuth
Payne Furnace & Supply Co.
Magic Way Company.
Pacific Gas Radiator Co.
Phillips Heating, Ventilating & Mfg. Co.

Furnaces, Industrial
C. B. Babcock Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Mueller Co.
Payne Furnace & Supply Co.

Gas Analysis Apparatus
The Foxboro Co., Inc.
Fort Worth Laboratories.
Jensen Instrument Co.
Pacific Meter Works.
United Engineers & Constructors, Inc.

Gas Masks
Safety Gas Main Stopper Co.

Gas Main Tapping & Drilling Machines
Mueller Co.

Gaskets
The E. A. Key Company
Pittsburgh Equitable Meter Co
Safety Gas Main Stopper Co.
Southwestern Pipe Joint and Engineering Co.

Gasket Compound
E. A. Key Co.

Gas Pipe Line Construction
Western Pipe & Steel Co.

Gates—Wind & Blast
The P. H. & F. M. Roots Co.

Gauges
The Bristol Company
Fort Worth Laboratories.
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Westcott & Gries, Inc.

Gauges, Steam
The Bristol Company
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Gries, Inc.

Gauges, U Type
C. B. Babcock Co.
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Lee B. Mettler.
Pacific Meter Works.
Safety Gas Main Stopper Co.
The Foxboro Co., Inc.
Westcott & Gries, Inc.

Generators, Water Gas
The Bartlett Hayward Co.
Baker Iron Works.

Glassware
Fort Worth Laboratories.
Westcott & Gries, Inc.

Governors
C. B. Babcock Co.
Chaplin-Fulton Mfg. Co.
L. H. Freymuth
Pacific Meter Works.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Westcott & Greis, Inc.

Hammers
Ingersoll-Rand Co.

Hanger, Meter
Mueller Co.

Hangers, Iron and Steel
Baker Iron Works.

Heaters
American Radiator Co.
C. B. Babcock Co.
Baker Iron Works.
The Estate Stove Co.
L. H. Freymuth
General Gas Light Co.
Magic Way Company.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
Welsbach Company.

Heaters, Floor
General Gas Light Co.
Magic Way Company.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

Heaters, Wall
C. B. Babcock Co.
General Gas Light Co.
Magic Way Company.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

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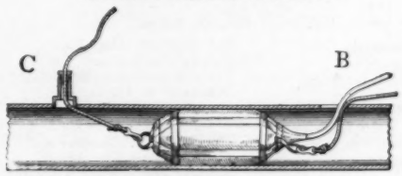

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Pacific Coast Representative:
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Western Pipe & Steel Co.

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Baker Iron Works.
United Engineers & Constructors, Inc.

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Baker Iron Works.
Western Pipe & Steel Co.

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The Bartlett Hayward Co.

Hose, Air
Ingersoll-Rand Co.

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C. B. Babcock Co.
Johnson Gas Appliance Co.
Geo. D. Roper Corporation.

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Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Incinerators
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Baker Iron Works.
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Incinerator Brickwork
J. T. Thorpe & Son, Inc.

Indicators
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Instruments (Measuring, Testing and Recording)
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Pacific Meter Works.
The Foxboro Co., Inc.
United Engineers & Constructors, Inc.
Westcott & Gries, Inc.

Insulating Materials
L. H. Freymuth
Stockton Fire Brick Co.

Joint Runners Asbestos
Safety Gas Main Stopper Co.
United Engineers & Constructors, Inc.

Kilns
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Kilns—Brickwork
The Bartlett Hayward Co.

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Fort Worth Laboratories.
Mueller Co.
Westcott & Greis, Inc.

Ladles, Hot Metal
Mueller Co.

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C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Lighters
C. B. Babcock Co.
Tappan Stove Co.

Lighting Incidentals
C. B. Babcock Co.
Welsbach Company.

Line Pipe—Steel
A. O. Smith Corporation
South Chester Tube Company

Linings—Brickwork
J. T. Thorpe & Son, Inc.

Main, Bags
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mains, Street
United Engineers & Constructors, Inc.
United States Cast Iron Pipe and Foundry Co.

Main, Stopper
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mantles, Gas Lighting
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Manometers
Fort Worth Laboratories.
Jensen Instrument Co.
Lee B. Mettler.
Westcott & Greis, Inc.

Meters, Air
The Bristol Company
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
The P. H. & F. M. Roots Co.
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Meters, Boiler
The Bristol Company
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., inc.

Meters, Burner Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Cast Iron Gas
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meter Connections
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Complaint
Pittsburgh Equitable Meter Co

Meters, Consumers
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Flow
The Foxboro Co., Inc.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, Fluid
The Bristol Company
The Foxboro Co., Inc.
Jensen Instrument Co.
National Meter Company
Pittsburgh Equitable Meter Company
Westcott & Gries, Inc.

Meters, Gas
Connersville Blower Co
Jensen Instrument Co.
National Meter Company
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
The P. H. & F. M. Roots Co.

Meters, Gasoline and Oil
Jensen Instrument Co.
National Meter Company
Pittsburgh Equitable Meter Co
Westcott & Gries, Inc.

Meters, High Pressure Distribution
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
National Meter Company
Pittsburgh Equitable Meter Co
Pacific Meter Works.
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, High Pressure Iron Case
The E. A. Key Company
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Industrial Consumers
The Bristol Company
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
The Foxboro Co., Inc.
The P. H. & F. M. Roots Co

Meters, Iron Case
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Laboratory
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Large Capacity
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Sprague Meter Co.
The P. H. & F. M. Roots Co.
Westcott & Greis, Inc.

Meters, Oil
Connersville Blower Co.
The Foxboro Co., Inc.
Jensen Instrument Co.
National Meter Company
Pittsburgh Equitable Meter Co
The P. H. & F. M. Roots Co.
Westcott & Greis, Inc.

Meters, Orifice
Jensen Instrument Co.
Pacific Meter Works.
Robinson Orifice Fitting Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Oxygen
Fort Worth Laboratories.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Oxygen and Hydrogen
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Prepayment
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Station
Connersville Blower Co.
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The P. H. & F. M. Roots Co.

Meters, Steam
The Bristol Company
Jensen Instrument Co.
The Foxboro Co., Inc.
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Meters, Test
Fort Worth Laboratories
Pacific Meter Works.
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Water
Jensen Instrument Co.
National Meter Company
Westcott & Greis, Inc.

Meters, Wet Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Mixers, Gas and Air
C. B. Babcock Co.
Geo. D. Roper Corporation.
Pacific Gas Radiator Co.

Oil, Diaphragm
Pacific Meter Works.

Over Heat Control
Robertshaw Thermostat Co.

Oxide
C. B. Babcock Co.
Stauffer Chemical Co.

Packing, Asbestos
Safety Gas Main Stopper Co.

Paint
The Arco Company.
Hill, Hubbell & Company.
McEverlast, Inc.
United Engineers & Constructors, Inc.

Photometers
Pacific Meter Works.
United Engineers & Constructors, Inc.

Pilots
The Cleveland Heater Co.
Payne Furnace & Supply Co.
Spencer Thermostat Co.
L. H. Freymuth

Pipe
A. O. Smith Corporation
United States Cast Iron Pipe and Foundry Co.
Western Pipe & Steel Co.

Pipe Compound
E. A. Key Co.

Pipe, Copper
Mueller Co.

Pipe Covering
Hill, Hubbell & Company.

Pipe Couplings
S. R. Dresser Mfg. Co.

Pipe—Iron
South Chester Tube Company

Pipe—Steel
A. O. Smith Corporation
South Chester Tube Company

Pipe Jointers
Mueller Co.

Plugs (testing mains and running service)
C. B. Babcock Co.
Jensen Instrument Co.
The Foxboro Co., Inc.
Safety Gas Main Stopper Co.
United States Cast Iron Pipe and Foundry Co.

Pre-Heaters
Baker Iron Works.
Western Pipe & Steel Co.

Producers, Gas
United Engineers & Constructors, Inc.
United States Cast Iron Pipe and Foundry Co.

Provers, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Pumps
C. B. Babcock Co.
Connersville Blower Co.
Ingersoll-Rand Co.
Mueller Co.
Pacific Meter Works.
Geo. D. Roper Corporation.
Safety Gas Main Stopper Co.
The P. H. & F. M. Roots Co.

Pumps—Liquid
The P. H. & F. M. Roots Co.

Pumps—Vacuum
The P. H. & F. M. Roots Co.

Purifiers
Baker Iron Works.
The Bartlett Hayward Co.
United Engineers & Constructors, Inc.

Purifying Materials
C. B. Babcock Co.
Stauffer Chemical Co.
United Engineers & Constructors, Inc.

Purifiers, Oil Absorption
Western Pipe & Steel Co.

Pyrometers (Indicating and Recording)
The Bristol Company
Fort Worth Laboratories
Jensen Instrument Co.
Westcott & Greis, Inc.

Radiants
C. B. Babcock Co.
General Gas Light Co.

Radiant Heaters
C. B. Babcock Co.
General Gas Light Co.
Pacific Gas Radiator Co.
Welsbach Company.

Radiators—Gas Fired
American Radiator Co.
Magic Way Company.
Pacific Gas Radiator Co.

Ranges
C. B. Babcock Co.
The Estate Stove Co.
Geo. D. Roper Corporation.
Tappan Stove Co.

Ranges, Closed Top
C. B. Babcock Co.
Geo. D. Roper Corp.
Tappan Stove Co.

Receivers, Air
Ingersoll-Rand Co.
Western Pipe & Steel Co.

Recorders
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Refrigerating Machinery
C. & G. Cooper Co.
Ingersoll-Rand Co.

Refractory Materials
Gladding, McBean & Co.
Stockton Fire Brick Co.
United Engineers & Constructors, Inc.

Regulators, Heat
American Radiator Co.
C. B. Babcock Co.
Leahy Mfg. Co.
Magic Way Company.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
The Foxboro Co., Inc.

Regulators, High Pressure
C. B. Babcock Co.
Leahy Mfg. Co.
The Bristol Company
Chaplin-Fulton Mfg. Co.
Fort Worth Laboratories.
Gilfillan Machine Works, Inc.
Reliance Mfg. Co.
Mueller Co.
Reynolds Gas Regulator Co.
Sprague Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Regulators, Hot Water Heat Control
The Bristol Company
Mueller Co.

Regulators, Low Pressure
C. B. Babcock Co.
The Bristol Company
Chaplin-Fulton Mfg. Co.
L. H. Freymuth
Fort Worth Laboratories.
Gilfillan Machine Works, Inc.
Phillips Heating, Ventilating & Mfg. Co.
Reliance Mfg. Co.
Mueller Co.
Reynolds Gas Regulator Co.
Sprague Meter Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Regulators, Temperature
C. B. Babcock Co.
The Bristol Company
Fort Worth Laboratories
Jensen Instrument Co.
Leahy Mfg. Co.
Magic Way Company.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Regulators, Oven
C. B. Babcock Co.

Repairs—Brickwork
J. T. Thorpe & Son, Inc.

Retorts
The Bartlett Hayward Co.
United Engineers & Constructors, Inc.

Riveted Pipe
The Bartlett Hayward Co.

Rotisserie
C. B. Babcock Co.
General Gas Light Co.

Scrubbers
Baker Iron Works.
The Bartlett Hayward Co.
United Engineers & Constructors, Inc.
Western Pipe & Steel Co.

Service Cleansers, Renrut
Safety Gas Main Stopper Co.

Settings, Boiler and Bench
J. T. Thorpe & Son, Inc.

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Western Pipe & Steel Co.

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United States Cast Iron Pipe and Foundry Co.

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Western Pipe & Steel Co.

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The Bartlett Hayward Co.
Western Pipe & Steel Co.

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Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Steel Work, Structural
Baker Iron Works.
Western Pipe & Steel Co.

Stills
Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Stoppers, Gas Main
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Stoppers, Goodman Cylindrical Intermediate Pressures
Safety Gas Main Stopper Co.

Stops, Brass
Mueller Co.

Stops, Iron Body
Mueller Co.

Strainer, Gas, Water, Air, and Oil
Mueller Co.

Systems—Heating
American Radiator Co.
C. B. Babcock Co.
Magic Way Company.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.

Systems, Hot Water Heat Control
The Cleveland Heater Co.
Mueller Co.

Tachometers
The Bristol Company
Jensen Instrument Co.
Westcott & Greis, Inc.
The Foxboro Co., Inc.

Tanks
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Thermometers (Indicating and Recording, etc.)
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Thermostats, all kinds
American Radiator Co.
C. B. Babcock Co.
The Bristol Company
The Cleveland Heater Co.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
Robertshaw Thermostat Co.
Spencer Thermostat Co.

Tile, Refractory
Gladding, McBean & Co.
Stockton Fire Brick Co.

Tools
Mueller Co.
Safety Gas Main Stopper Co.

Traps, Steam
Jensen Instrument Co.

Trench Excators
C. B. Babcock Co.
The Cleveland Trencher Co.

Tubing—Iron
Mueller Co.
South Chester Tube Company

Tubing—Steel
South Chester Tube Company

Unions
Leahy Mfg. Co.
Mueller Co.
Pittsburgh Equitable Meter Co

Valves, Back Pressure
C. B. Babcock Co.
The Bristol Company
Chaplin-Fulton Mfg. Co.
Jensen Instrument Co.
Reynolds Gas Regulator Co.
Westcott & Greis, Inc.

Valves, Electro-Magnetic
C. B. Babcock Co.
The Bristol Company
Magic Way Company.

Valves, Gas Engine
The C. & G. Cooper Co.

Valves, Gate
Baker Iron Works.
The Bartlett Hayward Co.

Valves, Needle for Gas Stoves
C. B. Babcock Co.

Valves, Relief
The Bartlett Hayward Co.
Chaplin-Fulton Mfg. Co.
Jensen Instrument Co.
Leahy Mfg. Co.
Mueller Co.
Reynolds Gas Regulator Co.
The P. H. & F. M. Roots Co.

Valves, Plug
Jensen Instrument Co.
Merco Nordstrom Valve Co.

Varnishes
Hill, Hubbell & Company.

Vulcanizers (Tube) Gas
Reliance Mfg. Co.

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Western Pipe & Steel Co.

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Charles R. Collins.

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Rotary Manufacturing Co.
Welsbach Company.

Yarn, Calking
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NATURAL GAS ENGINEERS
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P. O. BOX 669 LONG BEACH, CALIFORNIA

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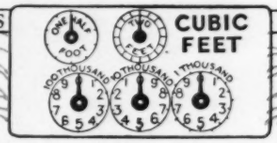
KNOWN FACTORS  IN METER VALUE

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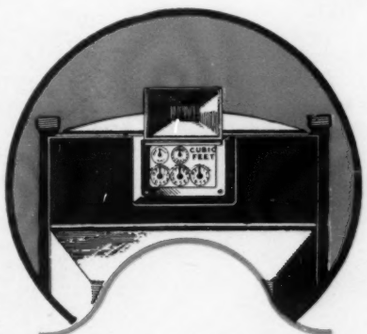

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